Submission No. 5

Submission to the House of Representatives Standing Committee on Industry and Resources

Inquiry into the development of the non-fossil fuel energy industry in Australia

CASE STUDY INTO THE STRATEGIC IMPORTANCE OF AUSTRALIA'S URANIUM RESOURCES

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[redacted]

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Qualifications of the Commentator

Professional involvement in production, research and management in the Australian metals, minerals and mining industry over 55 years.

Batchelor of Science (metallurgy, chemistry. physics and geology)

Honorary Fellowship of the Australasian Institute of Mining and Metallurgy

Recipient of the Sir Willis Connolly Medal

Order of Australia Medal for services to mining

More specifically :

Chairman of the Australian Uranium Information Centre 1983 –1986
Convenor of informal uranium mining groups 1980's
Manager Corporate Affairs, Western Mining Corporation Ltd 1978-1986
Author and presenter of WMC Ltd's Submission to the South Australian Parliamentary Select Committee on Uranium Resources, April 1980
Visits of inspection to nuclear facilities overseas, including yellow cake conversion to produce metallic uranium (Springfields, UK), uranium enrichment (Capenhurst, UK and Tricastin, France), high level nuclear waste reprocessing (Marcoule, France), nuclear power plant construction (Muhlhiem Kaerlich, Germany), operating nuclear plants (Tokaimura, Japan and Goesgen, Switzerland) and a large fast neutron breeder reactor (Creys Malville, France), all during the 1970s and 1980s.
Participant in public debates on uranium mining and nuclear power at the time of the Ranger Enquiry and subsequent political discussion
Author of papers on nuclear matters given by invitation to professional and community group meetings and conferences
Attendance at several Australian Labor Party annual conferences at which the uranium question was being considered.

NOTE; This brief submission addresses in particular, items (b) and (c) of the committee's terms of reference. To enhance the benefit available from Australia's rich resource of uranium as a strategy, we should address the question of why we are not ourselves making use of it.

Summary Perspective

Australia has over one third of the world's known mineable uranium resources. It has been mining and exporting uranium oxide concentrate for over twenty years to a number of countries that use it for generation of electricity. These resources are of exceedingly great future importance to Australia, being, in terms of energy, equivalent to many billions of tonnes of coal .

The outlook for uranium export growth is very positive, firstly because the demand for primary output will rise considerably as secondary (ex military) sources of uranium diminish, and secondly, as the environmental advantages of nuclear electricity production are increasingly appreciated.

While benefiting from the trade, Australia itself does not use uranium for power generation purposes. In view of our large resources, overseas trading partners find this strange. If we were to become a user of uranium in our own right, our strategic position would be enhanced and potential benefits from our uranium resources increased.

Australia relies mainly on coal as the fuel for its electricity supply, and to a lesser on natural gas and hydro power. Coal is the most important for base load power supply.

Reliance on coal results in the release to the atmosphere of large quantities of carbon dioxide (CO_2), a "greenhouse" gas. The international Kyoto Protocol seeks to limit the possible global climatic effects of such emissions. This treaty has now entered into force, and whilst Australia is not a party, our responsibility to the world community is to decrease net emissions, but at the same time avoid loss of economic efficiency.

In pursuance of this policy Australia should seek to reduce reliance on fossil fuels, seek greater efficiency in their use and adopt alternatives that reduce or avoid greenhouse gas emissions.

The immediate alternatives, wind and solar, are already in use to a limited extent but because of their technological limitations and the intermittent availability of these energy sources, neither is applicable for base load electricity supply.

Globally, the most attractive alternative for electricity generation is nuclear energy, using low-enriched uranium as fuel. It involves no emission of greenhouse gas apart from a minor amount from the fossil fuels used in uranium mining and processing.

It is economically competitive. Its use, like coal, is mainly to provide continuous base load power. The technology is highly developed and achieves better safety performance than other sources of bulk power supply.

In its own interests and a as a contribution to the containment of greenhouse gas emissions globally, there is a strategic, economic and ethical case for Australia now, to include nuclear electricity generation in it energy infrastructure.

A case for establishing uranium fuelled electricity for Australia :

Legislation requires reform and confusion exists
Statutory restrictions in several states on exploration for and mining of uranium and its use for power generation, should be removed. These are legitimate activities that should not be proscribed by subjectively-motivated legislation of the past.

There is confusion arising from proposed greenhouse gas abatement initiatives, such as carbon trading on the one hand and at the same time, continuing support for increased coal based electricity development.

New generating capacity needed
Australia will need to increase electricity capacity and also to replace fossil fuel power stations that become obsolete. The choices of technology need to be considered in a timely manner and the implications well understood.

Use of coal involves large scale mining, coal preparation and transport to the users. It incurs environmental costs in land use for mining and mine waste disposal. Coal power stations require considerable land space, including fuel stockpiles and ash disposal areas. Operations result in atmospheric pollution and incur hazards for workers and associated communities.

Coal and nuclear impacts compared
The environmental impacts of a coal fired and a nuclear power station of equal capacity are very different.

A typical power station capacity in industrialised countries is 1000 megawatts of electricity (Mwe). Each year, such a fossil fuel power station in Australia burns some 3 million tonnes of black coal per year, releases about 7.5 million tonnes of CO_2 into the atmosphere and generates at least 300,000 tonnes of ash for local disposal.

A typical 1000 MWe nuclear power station uses only about 24 tonnes per year of uranium fuel* contained in metal tubes. To produce this amount of fuel, about 170 tonnes of natural uranium in the form of oxide concentrate (the product of uranium mining operations) needs to be processed. A nuclear plant emits no greenhouse gas.

* This fuel comprises pellets of uranium, as oxide, 'enriched' to around 3-4% U235. Natural uranium, as mined, contains 0.7% of U235, the isotope whose "splitting", releases heat energy within the reactor.

Coal and Nuclear comparison	Coal	Nuclear
Power Capacity	1000 Mwe	1000 Mwe
Fuel used	Black Coal	Uranium fuel
Quantity of fuel used per year	3,000,000 t	24 t
Carbon dioxide emission per year	7,500,000 t	nil
Ash produced for disposal per year	300,000 t	(see following)

Part of the fuel of a nuclear reactor is removed every year, the quantity being about the same as the input. This used (or spent) fuel is highly radioactive and is immediately placed into safe storage at the power station for later re-processing or final disposal when its radioactivity is greatly diminished by natural decay. If re-processed, un-reacted uranium is recovered and less than one tonne of other (fission product) wastes results. These wastes are also highly radioactive and therefore handled in purpose-designed shielding equipment to prevent human exposure. Before final disposal in appropriate containers, they are immobilised into an inert material such as glass.

Little space required
Nuclear power stations require comparatively little ground area. Fuel reserves can be stored within the power station, requiring very little space. Used nuclear fuel that has been removed from the reactor is also safely stored within operating power stations for long periods prior to disposal or reprocessing.

Safety
Nuclear power stations are intrinsically safe. Their safety performance has been very good. Normally, massive reinforced containment structures** house the reactors. The Chernobyl and some other Russian reactors were anomalous but have now been greatly improved.

World adoption of nuclear
The first nuclear elecrtric power stations were commissioned fifty years ago. There are now 441 reactors operating globally. Their total electrical capacity (over 350,000 MWe) is seven times that of Australia. A further 63 reactors are under construction and planned. Thirty-one (31) countries have nuclear reactors producing power and in thirteen (13) of these, more than a third of the electricity supply is nuclear.

Approximately 16% of total world electricity output is from uranium fuel. France is about 77% reliant on nuclear with 59 operating reactors and also exports power to a number of other European countries. Japan has 54 operating reactors and USA, 103.

Economics
The economics of nuclear power production in Australia has not been adequately studied. However it has become competitive with alternatives in many regions of the world, and its increasing use confirms its competitiveness.

** This is unlike the Chernobyl reactor in Ukraine that incurred the world's worst nuclear accident, but in the earlier Three Mile Island incident in the USA, the containment was a factor in preventing any human injury

An outcome of the Committee's inquiry should be to commission a thorough investigation of the economics of the nuclear electricity industry for Australia.

Is waste the issue?

Concerns regarding handling, storage and re-processing of used fuel and radioactive end-products from nuclear operations that require disposal are important considerations in securing acceptance of nuclear power. These were a foremost topic of discussion in Australia during "the uranium debate" period of the late 1970s and 1980s. There appears to be a residual perception that this is the ultimate reason why nuclear power is unacceptable here, despite our increasing prominence in the world uranium market.

Such a perception is inconsistent with the fact that in the 31 countries currently operating nuclear power stations, used fuel is routinely being removed from reactors, handled, stored, transported, and re-processed. These countries are safely managing this "back end" of the fuel cycle, as an intrinsic part of the nuclear electricity industry. Those responsible necessarily must have confidence in containing the risks and satisfactory waste disposal strategies.

Nuclear waste is safely handled

There is no record of adverse health effects or significant incidents or accidents in the handling, storage, transport and re-processing of used nuclear fuel ("wastes") from electricity generation over the fifty year life of the industry.

Means of disposal of used fuel and waste from re-processing have been successfully researched and put to use in several countries. Some countries choose to store used fuel, others to re-process it to recover useable uranium. The problems of disposal are now less technical than political. The technologies are well understood and a variety of safe means have been defined. Terminal storage facilities are already available in some places and in others, are being prepared.

Location of nuclear facilities

In Australia the matter of siting safe disposal of any radioactive wastes is, from a technical and safety viewpoint, readily achievable, having regard to the vast area of remote and geologically stable terrain available.

The problems lie in the politics of location as already shown in the unfortunate failure to determine a location for a national repository for low level medical and isotope wastes, whose risk to public safety and well-being was in reality, virtually non-existent.

Our failure is essentially because subjective political action has frustrated real understanding of the risks and benefits of establishing an engineered repository.

The same problem will of course arise when the time comes, in locating nuclear power stations in Australia, but doubtless there are many suitable sites.

Because of ingrained community perceptions, the matter of location of nuclear facilities is one that must be resolutely and exhaustively addressed and discussed as a key policy matter. Definition of processes for the resolution of this aspect are critical but must be approached with sensitivity and understanding of public concerns.

Advantages offered for Australia

A policy to use nuclear power in Australia has a number of attractions beyond its environmental merits, its contribution to global greenhouse emission abatement and the security of fuel supply from domestic resources that it offers.

(1) It would enhance our credibility in the global uranium trade and help secure a long term and beneficial participation.

(2) It would provide a new dimension of technology in Australia, in which our education and technical institutions would participate with great benefit.

(3) It would provide new and challenging opportunities to the manufacturing and service industries.

(4) New skilled and professional employment opportunities and career paths would be generated.

(5) It would stimulate possible adoption of down-stream industries such as uranium conversion (to UF_6), enrichment to fuel grade, and possibly fuel manufacture.

(6) It could offer an opportunity for Australia to become a world nuclear fuel provider in the longer term with the further possibility of offering fuel reprocessing and storage services. These would be most valuable industries and would strengthen Australia's already respected efforts in supporting the international instruments against proliferation of nuclear weapons.

In the longer term it can be expected that the use of hydrogen will eventuate as a substitute for present transport fuels. Its use is desirable as it generates no increase in greenhouse gas. Overseas technological research suggests that nuclear energy may well become a basis for production of hydrogen from water, employing catalytic processes and using heat energy from high temperature pebble bed or other new reactor concepts. (Contemporary alternative means of heat generation require use of fossil fuels with a net increase of greenhouse gas emission). The existence of a nuclear industry in place here could provide Australia with a leading edge entry into hydrogen technology rather than becoming simply a follower.

Conclusion and some suggestions for action

The conclusion is that as an industrial strategy initiative, based on its large uranium resource, Australia should seriously examine policies and stimulate consideration of nuclear energy for at least part of future electrical power needs.

It is appreciated that there will be opposition to such a proposal but that is very much to be expected. There is now however a significant groundswell in the Australian

community that this matter should be opened up and discussed in the light of available information and free of the subjective and untenable assertions-in-opposition that have been passively accepted in the past. Attention must be directed to the status of the world nuclear industry and its acceptance to an increasing degree, as a safe and economic source of power, even in countries where there has been strong opposition in the past. For example in Sweden, although earlier governments had resolved by statute to close at least part of the country's nuclear capacity, now, according to repeated polls, over 80% of Swedes wish the nuclear facilities to continue in operation and recognise their environmental importance.

One possible way of initiating dialogue in Australia is to arrange fact-finding missions of Australians with a range of expertise and view-points, to visit countries that have a nuclear industry, and brief them to report on its safety, acceptability and regulation. Some appropriate destinations are Japan, France, Sweden, the USA and Finland. The OECD's Atomic Energy Authority and United Nations' International Energy Authority should also be consulted.

Because of the importance of radiation as a public concern, the United Nations Scientific Commission on the Effects of Atomic Radiation (UNSCEAR) should also be consulted by these missions.

As a consequence of past political action, Australia does not have as strong a nuclear science and engineering establishment as it did in the early years of the Australian Atomic Energy Authority.

This technological gap needs to be addressed as part of the process of equipping the nation authoritatively to address the questions raised in this reference.

Also, a number of the public service areas would need to be equipped to deal with the many administrative and regulatory aspects that the advent of a nuclear industry will require.

This commentator commends that the Standing Committee address the several matters raised herein, which are not necessarily exhaustive, but are believed to be of importance to the strategic future of our economy and our status as a responsible world citizen, and one conscious of its responsibilities in long term sustainable development.