

AUSTRALIAN INSTITUTE OF NUCLEAR SCIENCE AND ENGINEERING (AINSE)

**Comments Prepared to Support AINSE Attendance Before
Parliamentary Inquiry into the Development of Non-Fossil Fuel Energy in
Australia: Case Study into the Strategic Importance of Australia's
Uranium Resources.**

House of Representatives, 13 October 2005

About AINSE

AINSE is a not for profit organisation which was set up 50 years ago to provide an opportunity for education, training and collaborative research in nuclear science and engineering and related fields. We provide competitive funding by which university researchers and research students gain access to the facilities and expertise at ANSTO.

We award about 200 nuclear-related research grants each year under a National Competitive Research Grants scheme, and support over 100 PhD students who are working on projects requiring access to nuclear science facilities.

The long standing AINSE partnership between ANSTO and Australia's 36 universities represents a most valuable research and training resource for Australia as it contemplates the nation's role in uranium mining and related nuclear technology. The broad profile of AINSE facilitated research covers the basic sciences, materials science, environmental science and biomedical science which provide highly relevant capability for strategic research on the nuclear fuel cycle.

AINSE submits that uranium mining in Australia should be considered in the broad context of the total nuclear fuel cycle. The country has a responsibility to consider rationally the role that it might play in the development of a world wide approach to energy supply and associated environmental impacts and security issues.

In addition to the role that AINSE might play as a facilitator for university-based strategic-basic research on the nuclear fuel cycle, the organisation is a valuable resource for Australia's engagement in research on (i) underlying nuclear and materials science through national and international collaboration, (ii) the beneficiation of nuclear waste through accelerator-driven transmutation treatment, and (iii) nuclear fusion research.

TOR 1 global demand for Australia's uranium resources and associated supply issues

- 1 there will be increased global demand for energy. This is well documented in the IEA Report *World Energy Outlook 2004*.
- 2 this will be expressed in a greater base energy load
- 3 the current mix of fuels is likely to change in favour of non-fossil fuels driven by global warming and the need to reduce CO₂ emissions
- 4 of the methods of power generation which contribute least to CO₂ emissions nuclear fission is the only one suited to the provision of a stable base load (the other 2 being wind and hydro)
- 5 another possible form of stable energy production is nuclear fusion. The International Thermonuclear Experimental Reactor (ITER) – refer submission 7 - experiment is expected to be the first fusion experiment which will return power to the grid. It has the advantage that the radioactive waste has a far shorter half life than that from fission reactors. However, the commissioning of the first fusion reactor is many decades off.
- 6 The projected increase in energy demands requires a solution now. Nuclear fission will be one component of multiple strategies needed – including renewables.

- 7 While nuclear fission power provides, today, the most viable solution, the international community has yet to agree on global strategies for the management of radioactive waste, its disposal and/or storage.
- 8 There is accelerator/ reactor- driven waste destruction research underway several countries (eg USA, France and Japan). In Japan at J-PARC the facility will not only provide intense beams for underlying nuclear science but also has a goal to explore ways of reducing the 100 year activity of highly radioactive isotopes by a factor of 100. Progress in this would be a step in reducing the storage time of waste from thousands of years to hundreds of years – especially if the process could be energy neutral. Australia should offer to participate in this program if the Australian government decides to become involved in the development of waste storage solutions.

TOR 2 strategic importance of Australia's uranium resources and any relevant industry developments

Mining

- 1 The Australian uranium mining industry already is a world leader in the supply of the raw material with 40% of the market today. By adopting a positive attitude to expansion, possibly linked to storage of waste, Australia's commercial and strategic interests could be served.
- 2 Furthermore the IEA report *World Energy Outlook 2004* provides good argument that the price of the ore will increase dramatically as stockpiles of ore and caches of highly enriched military fuel are depleted over the next decade.
- 3 The industry will not only be providing more jobs as a result of expansion but profitability should increase as the increase in market price exceed that of production costs.
- 4 A phased strategy for mining, refining and value adding to uranium exports is desirable.

Fusion power

- 4 Although the introduction of **fusion** power might seem a long way off, the initial experimentation is well underway. AINSE has maintained its interest in fusion research through changing Australian priorities.
- 5 If Australia were to be involved in this experiment, our scientists would have the opportunity of developing and sharing in **intellectual property** which will, in the future, be of considerable value.
- 6 In addition there would be an opportunity for Australian industry to participate in materials research and eventually the **production of the specialised materials** required for the containment of the plasma. In addition, Australian expertise should be joined to the control strategies for fusion reactors through the design and **development of software** which will be needed to control the reaction. There is a strategic interest in our being involved in this way, collaboratively and through home based research.

Storage

- 7 Because of the stable geological nature of the Australian mainland there may be good business opportunities associated with the storage and handling of nuclear waste.
- 8 If this were articulated with the technology being developed at J-PARC (see above - as concerns the Asia – Oceania region, for example), we could have a profitable new industry for Australia with strategic alliances.

TOR 3 potential implications for global greenhouse gas emission reductions from the further development and export of Australia's uranium resources;

- 1 Of the methods of power generation which contribute least to CO₂ emissions nuclear fission is the only one suited to the provision of a large and stable base load (the other 2 being wind and hydro)
- 2 A cradle to grave analysis of these three sources of power revealed that they produce under 10g CO₂ equivalent/kW hr in comparison with photovoltaic at hydrocarbon at about 100g CO₂ equivalent/kW hr (see Geosciences Australia submission)
- 3 It seems clear that for sustainable development we need to develop a mix of power sources with the least environmental cost. This will include all those currently used including the renewables as well as nuclear.

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