Submission No. 33

House of Representatives Standing Committee on Industry and Resources inquiry on the non-fossil fuel energy industry in Australia

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The Strategic Importance of Australia's Uranium Resources

I INTRODUCTION

Prospects for nuclear energy

1. In its report *World Energy Outlook 2004,* the International Energy Agency (IEA) stated that 'If governments stick with the policies in force as of mid-2004, the world's energy needs will be almost 60% higher in 2030 than they are now.' (International Energy Agency, *World Energy Outlook 2004,* OECD, Paris. p29). In its Reference Scenario, the IEA observed that the cost and challenge of maintaining the status quo or current trends 'will require massive investments. ... $568 billion per year until 2030 [of which] the electricity sector will absorb the majority of this investment' (IEA op.cit. p30). Put a different way, this means that 'the global power sector will need about 4 800 GigaWatts (GW) of new capacity to meet the projected increase in electricity demand and to replace ageing infrastructure' (IEA op.cit. p34).

2. The IEA report states that 'The trends, from [its] Reference Scenario, are, however, not unalterable. More vigorous government action *could* steer the world onto a markedly different energy path' (IEA op.cit. p30). Developing this, the IEA presents a World Alternative Policy Scenario which 'depicts a more efficient and more environment-friendly energy future than does the Reference Scenario [in which] global primary energy demand would be about 10% lower in 2030 than in the Reference Scenario [and] by 2030, energy-related emissions of carbon dioxide would be 16% lower than in the Reference Scenario' (IEA op.cit. p37). Further, in the World Alternative Policy Scenario 'oil demand is 12.8 million barrels per days (mb/d) lower [with] the demand for coal fall[ing] more steeply than that for any other fuel [and] energy-related emissions of carbon dioxide would be reduced by some 6 Gigatonnes or 16% below the Reference Scenario figure in 2030'. The IEA notes that this scenario suggests a shift in the fuel mix for power generation in favour of renewables and nuclear energy (IEA op.cit. p367).

3. Regarding the clean production of electricity, the IAEA reports (IAEA, 2002, *Nuclear Power and Sustainable Development.* Vienna) that 'while nuclear power currently generates 16% of the world's electricity it produces virtually no sulphur dioxide, particulates, nitrogen oxides, volatile organic compounds or greenhouse gases.' The IAEA goes on to note that 'The complete nuclear power chain, from resource extraction to waste disposal including reactor and facility construction, emits only 2-6 grams of carbon equivalent per kilowatt-hour. This is about the same as wind and solar power including construction and component manufacture. All three are two orders of magnitude below coal, oil and natural gas.'

4. Based on these analyses, nuclear energy can be expected to have an important place in meeting future energy needs over the next few decades. From this it is apparent that Australia's uranium holdings are an internationally strategic resource which can only grow in significance. Since the whole world stands to benefit from addressing the important issue of global warming, including through energy policies which give a significant place to nuclear energy, then development of this strategic resource is clearly consistent with our national and international interests.

Non-proliferation aspects

5. In itself nuclear power does not present a problem for the proliferation of nuclear weapons. But nuclear energy requires fissile material, and the technologies used to produce nuclear reactor fuel–uranium enrichment or plutonium separation–can also be used to produce

fissile material for nuclear weapons. The diversion of nuclear material from peaceful uses could also contribute to development of nuclear weapons, although in most cases enrichment or reprocessing capabilities would also be required.

6. For these reasons, the widespread use of nuclear energy needs to be accompanied by measures to counter the proliferation of nuclear weapons. This has long been recognised through the ongoing development and refinement of the nuclear non-proliferation regime. The non-proliferation regime has been remarkably successful, but has had to respond to challenges over the years, and must continue to do so to remain effective. If such challenges are not met, the expansion of nuclear energy will come to be seen, by governments and the public alike, not as a benefit, but as a risk to international security.

7. Ensuring an effective non-proliferation regime requires effective control over both nuclear material and proliferation sensitive technologies. On the technical side, there is the need to ensure credible verification: confidence that safeguards are effective to detect both misuse of declared facilities or nuclear material, and the existence of undeclared facilities or material. Another important technical goal is the development of proliferation-resistant technologies, including possibly in the future a fuel cycle that does not require enrichment and currently-established reprocessing technologies.

8. However, technical approaches alone are not sufficient. Safeguards cannot provide assurance about a state's intentions. Building and maintaining confidence also requires action at the political level. In particular, it is vital to the future of the non-proliferation regime to limit the spread of enrichment and reprocessing technologies. An international framework is needed that balances the right to benefit from nuclear energy with the right to protect national and international security through reducing the risk of proliferation. Given widely competing national interests, this is a difficult objective to pursue. Nonetheless, the G8 (France, the United States, the United Kingdom, Germany, Japan, Italy, Canada, the EU and Russia), the IAEA and the Nuclear Suppliers Group (NSG) are considering multi-nation arrangements to limit the expansion and use of proliferation-sensitive technologies such as enrichment and reprocessing.

9. Clearly what is needed is a framework for international cooperation, under which states can be assured of access to nuclear fuel and reactors on reasonable and non-discriminatory terms in exchange for eschewing national development of proliferation-sensitive technologies. Another concept that might be examined is that of multi-nation operation of sensitive facilities, although again this has been explored in the past without particular progress. Further advances seem unlikely in the short term..

10. Australia is closely involved in international efforts to address these issues. Our position as a major uranium exporter gives us both the responsibility and the standing to pursue these issues effectively, e.g. through our position as a member of the IAEA Board of Governors and in other fora, such as the NSG. Australia played a prominent role in the negotiation of the Additional Protocol strengthening IAEA safeguards, and this instrument is now widely recognised as the new standard to which states should adhere. We were the first country to sign and ratify an Additional Protocol, and at the NPT Review Conference in New York in May this year I announced that Australia would take the lead in making the Additional Protocol a pre-condition for the supply of Australian uranium to non-nuclear weapon states. This further strengthens the stringent conditions for supply of Australian

uranium and underscores the Government's commitment to practical measures to combat the threat of nuclear proliferation.

11. Australia has an active regional outreach program on safeguards and non-proliferation issues. The Director General of the Australian Safeguards and Non-Proliferation Office (ASNO) chairs the IAEA's Standing Advisory Group on Safeguards Implementation.

II SUBMISSION IN RELATION TO SPECIFIC TERMS OF REFERENCE

TOR (a) *global demand for Australia's uranium resources and associated supply issues*

12. As of April 2005 there were 441 power reactors in operation in over 30 countries, with a total electrical generating capacity of just over 360 GWe, and an annual electrical output of around 2 660 terawatt hours (TWh)[1]. These reactors produced approximately 17% of total world electricity (Annex 1). Of these, 360 reactors were operated by countries eligible to use Australian uranium under bilateral agreements with Australia (Annex 2), producing approximately 14.5% of total world electricity. Nuclear energy's contribution to electricity production in countries using Australian uranium ranged from 5% in Mexico to 78% in France.

13. The world's total demand for uranium to fuel power reactors in 2002 (the most recent year for which comprehensive figures are available) was estimated[2] as equivalent to 68 815 tonnes of Uranium Ore Concentrates (UOC), of which only 36 042 tonnes (54%) represented new production by mines. The remaining fuel requirements were met (in decreasing order of current importance) from:

(a) use of uranium inventories (reserves) held by power and conversion utilities—30% of total world demand;

(b) down-blending of Russian and US high enriched uranium (HEU) removed from decommissioned weapons and military stockpiles (10-13% of total world demand)—current arrangements run up to 2012 covering the period of Moscow Treaty reductions;

(c) re-enrichment of depleted uranium tails—this involves stripping of the residual fissile uranium from depleted uranium tails at enrichment plants. This is only commercially viable if there are enrichment plants with low operating costs and available excess capacity (3-4% of total world demand); and

(d) use of recycled/reprocessed uranium (approximately 1% of total world demand).

In addition, some 2-3% of the demand for reactor fuel was met by the use of recycled plutonium in the form of Mixed Oxide Fuel (MOX).

14. Of the non-mine sources of uranium supply listed above, only the enrichment of depleted uranium tails can be ramped up to maintain supply in the event of a major draw-down of utility inventories. While utilities built up substantial inventories in the 1970s and

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1 Based on 2002 world energy statistics from Key World Energy Statistics 2004 - OECD/IAE

2 Uranium 2003: Resources, Production and Demand (OECD/NEA "Red Book")

80s, these inventories or stockpiles will be exhausted over the next decade. The supply of HEU retired from weapons will also fall away, unless more is released from weapons stockpiles. As the demand for uranium is relatively inelastic with respect to the price of natural uranium supply there is expected to be a major increase in price as the inventory draw-down process comes to an end. Reprocessing capacity limitations would prevent recycled uranium or plutonium from substantially affecting such price rises.

15. Clearly expansion of the international uranium mining industry will be required to meet future demand even if there is no significant expansion of the nuclear power industry.

16. In 2004 Australia exported 9 157 tonnes of uranium ore concentrates (U_3O_8), amounting to 7 765 tonnes of uranium itself, earning over $410 million. This quantity of uranium is sufficient for the annual fuel requirements of some 41 reactors (each of 1000 MWe), producing around 370 TWh[3] of electricity in total—well in excess of Australia's own electricity production, which in 2002 totalled about 200 TWh[4]. Australian uranium was supplied to customers in the following countries in 2004.

Table 1 Supply of Australian uranium in 2004

Country	*Tonnes UOC (U_3O_8)*	*% of total (rounded)*
European Union	2 284.36	24.9%
Japan	2 292.49	25.0%
USA	3 513.89	38.4%
Republic of Korea	930.00	10.2%
Canada	136.08	1.5%
Total	9 156.82[5]	100.0%

17. There are three uranium mines operating commercially in Australia: Ranger in the Northern Territory; and Beverley and Olympic Dam in South Australia. Rounding up the figures, these mines each have an annual uranium production of approximately 5 000, 900 and 3 700 tonnes respectively. While Olympic Dam is likely to expand by a factor of up to four over the next decade, Ranger is expected to close (ore body exhausted) within the next 5-6 years. At its annual general meeting on 27 April 2005 ERA announced that eventual mine closure is likely at some time beyond 2011. Energy Resources of Australia Ltd, which owns Ranger, has sought to open a new adjacent mine at Jabiluka some 20km north of Ranger, but this is subject to consent from the traditional owners, the Mirarr Gundjeihmi Aboriginal people. I expect that the Department of Industry, Tourism and Resources will provide a more detailed explanation of the capacity and future of these mines and others in Australia which may be in prospect.

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3 Figure based on a heat conversion of 500GJ/kg for a typical LWR with 3.3% enriched uranium fuel, and a thermal efficiency of 33% (from Nuclear Electricity 7th Edition 2003 – Uranium Information Centre, www.uic.com.au).

4 Based on data from the Energy Supply Association of Australia (http://www.esaa.com.au).

5 This amount is not necessarily equal to Australia's exports during 2004 due to timing differences in the reporting of exports and receipts

TOR (b) ***strategic importance of Australia's uranium resources and any relevant industry developments***

18. As of 1st December 2004 Australia held about 40% of the world's reasonably assured uranium resources recoverable at less than US$40/kg, and 29% of such resources recoverable at less than US$80/kg[6]. In 2004, the Ranger and Olympic Dam mines were respectively the world's second and third largest uranium producers, and overall Australia was the world's second largest uranium exporter after Canada.

19. As a stable, secure low-cost uranium producer Australia is likely to occupy a key position in world uranium supply. Not only does Australia hold the largest uranium reasonably assured recoverable resources, it also holds a significant share of the market in areas where nuclear power is expanding; principally, North Asia (Japan, Republic of Korea). Further, Australia is exploring with China at officials' level the possibility of a nuclear safeguards agreement which would enable it to sell uranium there. China has indicated an intention to expand its nuclear power industry by a factor of up to four over the next two decades and could become a significant uranium market.

20. Indonesia, Thailand and Vietnam are also considering the possibility of nuclear power. These countries could become markets for Australian uranium, provided bilateral safeguards agreements were concluded with them.

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

21. It is well recognised that nuclear power already contributes to reduced greenhouse gas emissions worldwide. The IAEA states that, by generating approximately 17 per cent of the world's electricity, nuclear power avoids the emission of 600 million tonnes of carbon every year. Put another way, 'if the world were not employing nuclear power today, global carbon dioxide emissions would be at least 8 per cent greater every year'[7].

22. The Final Statement from the International Ministerial Conference, Nuclear Power for the 21st Century[8], held in Paris in March 2005, noted that 'The health of the planet's environment, including action to reduce air pollution and address the risk of global climate change, is a serious concern that must be regarded as a priority by all Governments'. The report continues, 'A diverse portfolio of energy sources will be needed in the 21st century to allow access to sustainable energy and electricity resources in all regions of the world. Efforts will be needed as well to improve energy efficiency, while limiting air pollution and greenhouse gas emissions.'

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6 Data for Australia compiled as of December 2004 by Geoscience Australia (draft publication *Australia's Identified Mineral Resources 2005*). Estimates for all other countries are from OECD/NEA and IAEA 2004. *Uranium 2003: Resources, Production and Demand,* Paris.

7 http://www.iaea.org/Publications/Factsheets/English/electric.html

8 http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2004/cn122-final-statement.pdf

23. At the Paris conference, a significant majority affirmed that nuclear power could make a major contribution to meeting energy needs and sustaining the world's development in the 21st century, given that it:

- does not generate air pollution or greenhouse gas emissions;
- is a proven technology, which under many circumstances provides competitively priced electricity;
- contributes to the security of supply and to the stability of energy; and
- can also make a valuable contribution through the production of potable water and hydrogen.

24. At this conference Dr. Mohamed ElBaradei, Director General of the IAEA, said '... even the most conservative estimates predict at least a doubling of energy usage by mid-century', and that with the reduction of carbon emissions becoming a top priority, both nuclear and renewable sources could have much larger roles to play in fulfilling this need. However, ElBaradei said, also, 'The problem is that no "renewable" source has been demonstrated to have the capacity to provide the "baseload" amounts of power needed to replace large fossil fuel plants'.

25. This forecast increase in nuclear power will require an increase in the supply of uranium, principally from mines as the predicted stockpiles at processors and ex-weapons sources are expected to decline significantly over the next 10 years. Australia, holding major reserves of uranium, and being a stable and dependable trading partner, will be seen as a desirable source of nuclear material to fuel expanding nuclear industries.

26. In the context of the Kyoto Protocol, the IAEA, having examined the issue of nuclear energy in terms of avoidance of carbon dioxide emissions and taken into account the possibility that 'many developing countries may not be able to afford the higher investments associated with a nuclear power project, or because nuclear may simply not be the least-cost generation option for a given country' (IAEA, 2000. *Nuclear Power for Greenhouse Gas Mitigation*, Vienna), has concluded that there is considerable scope for nuclear energy to make a significant contribution to the reduction of greenhouse gases worldwide on an affordable trading basis. The IAEA acknowledges that certain forms of subsidy may be necessary in some instances, but believes that the Kyoto Protocol flexible mechanisms[9] give ample opportunity for this. Such arrangements will help to make nuclear energy more affordable and more attractive with a resultant overall increase in the demand for uranium.

TOR (d) ***current structure and regulatory environment of the uranium mining sector (noting the work that has been undertaken by other inquiries and reviews on these issues).***

27. In Australia the uranium mining industry comes under the oversight and regulation of both Commonwealth and State (SA, NT) Governments. Relevant Commonwealth authorities are:

Australian Safeguards and Non-Proliferation Office;

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9 The Kyoto Protocol contains three flexible mechanisms (1) Clean Development Mechanism (CDM), (2) Emission Trading (ET) including trade in 'Hot Air', and Joint Implementation (JI).

Department of Industry, Tourism and Resources;

Department of the Environment and Heritage (DEH) including the Supervising Scientist (OSS); and

Australian Radiation Protection and Nuclear Safety Agency.

Australian Safeguards and Non-Proliferation Office (ASNO)

28. Through the *Nuclear Non-Proliferation (Safeguards) Act 1987* (Safeguards Act), the Minister for Foreign Affairs and ASNO have three key interests in the regulation of uranium mines:

- ensuring produced uranium is properly accounted for;
- ensuring effective control of uranium, i.e. that it is available only to authorised persons, for authorised purposes—including the physical protection of such material;
- ensuring exports take place only under the terms of Australia's bilateral safeguards agreements.

29. Uranium producers are required to maintain **accountancy** records as one of several measures to effectively control access to UOC, and to allow Australia to meet all of its international obligations in respect to the production and export of this material. This includes records of production, export licensing and shipping documentation.

30. Exercising effective **control**, ensuring that uranium is available only to authorised persons, also requires that there are appropriate levels of **physical protection** (PP) at the mines themselves and the UOC stored there. ASNO sets out specific PP requirements and inspects the mines annually. ASNO requires the uranium mines to adopt and report on specific procedures to ensure appropriate levels of physical protection for shipments of UOC from Australia to the port of unloading overseas. These procedures included checking on the physical condition of the containers and verifying the container and seal numbers at each port of unloading or transhipment. At the time of export ASNO contacts its counterparts in countries through which the material will transit, alerting them to the need to protect appropriately Australian Obligated Nuclear Material (AONM) within their jurisdictions.

31. ASNO has commissioned a thorough security risk review of uranium and its transport in Australia, the final report of which is expected mid-2005. By virtue of its role as the provider of protective security advice to the Australian Government, ASIO was selected to conduct this work which includes a current National Security Threat Assessment. While this report will bring forward some recommendations to further strengthen the protective security arrangements at the mines and during transport against currently perceived threats, the review identified no significant shortcomings. This result is expected given that the current (terrorist) threat to UOC infrastructure remains (very) low and because UOC is weakly radioactive, meaning there would be minimal radiological consequences arising from any incident occurring during transport.

32. Further, it should be noted that the Government has introduced counter-terrorism initiatives that require ASIO checks on staff associated with key transport infrastructure, eg at airports and maritime ports, and for some dangerous and hazardous goods. Should this

initiative be extended to cover land transport, a large majority of those persons associated with the handing of uranium will then have been checked and certified.

33. Accounting, control and PP matters are regulated through permits issued under the Safeguards Act. Permits are issued to holders of nuclear material defined in the IAEA Statute Article XX which concerns special fissionable material and source material (including uranium ore). Under sections 13 and 16 of this Act, ASNO issues permits to possess or transport nuclear material subject to restriction and conditions in respect of, *inter alia:*

- The location at which nuclear material may be held and the procedures to be followed if such material is to be transported from one location to another;
- The measures to be taken to ensure the physical security of nuclear material;
- The persons, or class of persons, allowed access to nuclear material and the conditions of such access;
- Records to be maintained;
- Uses to which nuclear material may be put;
- Reports to be furnished and inspections to be permitted;
- Transfer of nuclear material between permit holders;
- Alteration, dispersal or disposal of nuclear material;
- Sufficient information to allow inspectors to comply with health and safety procedures at a facility.

34. The Safeguards Act implements Australia's obligations under the *Convention on the Physical Protection of Nuclear Material (1979)* (CPPNM). This Convention applies principally to the **physical protection** of nuclear material in international transport. A Diplomatic Conference will convene in July 2005 to address proposed revisions to the present Convention to extend the scope to include domestic use, storage and transport. The Objectives and Fundamental Principals of Physical Protection (see Annex 3) were endorsed by the IAEA Board of Governors in 2001 and now form part of the proposed revision to the Convention (Article 2A). Underpinning the CPPNM, the IAEA has issued detailed guidance on The Physical Protection of Nuclear Materials and Nuclear Facilities—INFCIRC/225/Rev.4 (Corrected). This guidance aims 'To establish conditions which would minimize the possibilities for *unauthorised removal* of nuclear material and/or for *sabotage*.' Australia applies the requirements of INFCIRC/225 domestically and, through its bilateral safeguards agreements, requires its partners to do the same.

35. Uranium mining and milling has been the subject of many inquiries including:

- The Ranger Uranium Environmental Inquiry (RUEI), also known as the Fox report, 1975-1977
- Australian Science and Technology Council (ASTEC) on Australia's Role in the Nuclear Fuel Cycle, May 1984
- Senate Select Committee on Uranium Mining and Milling, *Uranium Mining and Milling in Australia*, May 1997

- Senate Environment, Communications, Information technology and the Arts References Committee, *Jabiluka: The Undermining of Process – Inquiry into the Jabiluka Uranium Mine Project,* June 1999
- Senate Environment, Communications, Information Technology and the Arts References Committee, *Regulating the Ranger, Jabiluka, Beverley and Honeymoon uranium mines*, October 2003.

While primarily focussing on environmental issues these reports also covered regulatory aspects of safeguards:

36. One of the principal findings of the Fox report was that 'any development of Australian uranium mines should be strictly regulated and controlled' and that 'No sales of Australian uranium should take place to any country not party to the NPT' and 'should be subject to the fullest and most effective safeguards agreements.' This was consistent with the report, *Uranium, Australia's Decision 1977* and remains Australian policy.

37. ASTEC reported in May 1984 it was satisfied 'overall that [Australia's bilateral] agreements meet the policy requirements and that those requirements are sufficiently comprehensive to provide as much control as can be realistically expected. We consider that Australian uranium and nuclear material derived from it are adequately accounted for and that Australia has the best possible guarantees that such material is being used solely within the civil nuclear programs of Australian customer countries'.

38. The Senate Select Committee on Uranium Mining and Milling underlined the importance of Australia maintaining its long record of contributing to the vitality of safeguards, international and national.

39. The 2003 References Committee did not make any recommendations pertaining to safeguards but made numerous recommendations relating to environmental monitoring and regulation.

40. The operation of Australia's bilateral safeguards agreements is described later.

Department of Industry, Tourism and Resources (DITR)

41. DITR (Uranium Industry) focuses on ways to encourage and manage the development and operation of Australia's uranium industry by:

- reducing impediments to the development and operation of uranium projects;
- granting export permits for items listed under Schedule 7 of the Customs (Prohibited Exports) Regulations 1958; and
- seeking to ensure a more consistent and accountable regulatory regime for uranium mining that meets environmental objectives.

42. The Minister for Industry, Tourism and Resources also has responsibility for the *Atomic Energy Act 1953* under which the Ranger mine Authority is issued.

South Australian Regulatory Controls

43. An environmental impact statement (EIS) is required as a precursor to any new uranium mine development. This EIS is required under the South Australian Development Act 1993. The regulatory control over the transportation and possession of uranium ore or its refined products is by way of South Australian Cabinet approval of a transport plan. This transport plan forms part of an administrative regime, arranged in consultation with relevant State authorities including the Emergency Services Agencies, the Department of Transport and Urban Planning, and the Environmental Protection Agency. The transport plan must meet all the legislative and regulatory requirements of the South Australian government.

Department of the Environment and Heritage

44. If a *nuclear action* (e.g. uranium mining and milling), as defined by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), is proposed that is likely to have a significant impact on the environment as defined in the EPBC Act, it would have to be referred to the Minister for the Environment and Heritage or the Department of Environment and Heritage. If it was determined that the proposal was likely to significantly impact on the environment it would then undergo a formal assessment process with public review such as an environmental impact statement. The Minister for the Environment and Heritage would then consider whether or not to approve the proposal and if so what conditions to impose taking into account the assessment documentation produced by the proponent, the assessment report provided by the assessing agency and other relevant matters. In considering approval the Minister must also consider economic and social matters and take into account the principles of ecologically sustainable development.

The Office of the Supervising Scientist (OSS)

45. The Supervising Scientist is responsible for the environmental oversight of uranium mining activities in the Alligator Rivers Region of the Northern Territory of Australia under the *Environment Protection (Alligator Rivers Region) Act 1978.* Ranger is the only uranium mine currently operating in the Region, although others have previously operated at Nabarlek and in the South Alligator River valley. Significant uranium deposits at Jabiluka and Koongarra also lie within the Alligator Rivers Region. The region includes Kakadu National Park which has been placed on the World Heritage List in recognition of both natural and cultural heritage values.

Northern Territory Regulatory Controls

46. Day-to-day regulation of uranium mining in the Northern Territory is the responsibility of the Northern Territory Government under the *Mining Management Act 2001.* Separately, Part III of the Northern Territory *Radioactive Ores & Concentrates (Packaging and Transport) Act* specifies licence requirements for the transport and storage of uranium. The Authority that issues these licences is NT WorkSafe—the administrative and regulatory arm of the Northern Territory Work Health Authority.

III OTHER MATTERS

Mechanisms to facilitate uranium mining and resource development

47. A matter on which the Committee has sought information which, at least in part, falls within the jurisdiction of ASNO, is ***assessing the extent of federal subsidies, rebate and other mechanisms used to facilitate uranium mining and resource development.***

48. A number of ASNO's activities benefit Australia's uranium exporters. Consequently, the Government recoups about 40% of ASNO's annual costs for safeguards activities through the Uranium Producers Charge. This corresponds to full cost recovery for the proportion of ASNO's costs considered to be of direct benefit to the uranium industry.

49. The fee is charged on each kilogram of production, and includes a component for future costs, that is, the ongoing costs in respect of AONM which could remain in the fuel cycle for a considerable period after a mine has ceased production i.e. this is a whole-of-life approach to cost recovery. In October 2004 the fee was set at 5.8192 cents per kilogram of contained uranium produced during 2003–2004. This yielded $470 026 for Consolidated Revenue.

Effectiveness of safeguards regimes

50. A second matter on which the Committee has sought information concerns ***the effectiveness of safeguards regimes in addressing the proliferation of fissile material, the potential diversion of Australian obligated fissile materials, and the potential for Australian obligated radioactive materials to be used in 'dirty bombs'.***

51. Under Australia's safeguards policy, which has been in place since 1977, uranium exports are permitted only under stringent non-proliferation conditions. Uranium exports are made only to selected countries and are covered by a bilateral safeguards agreement between Australia and the country concerned. Australia's requirements, set out in these agreements, are outlined below.

52. Australia has 19 bilateral agreements, covering 36 countries[10], and Taiwan, China. These agreements are listed in Annex 2.

53. The key point is that Australia's safeguards requirements are superimposed on IAEA safeguards. IAEA safeguards provide the basic assurance that nuclear material is not being diverted from peaceful to non-peaceful purposes.

54. It should be noted that IAEA safeguards are generally not concerned with origin attribution, that is, the 'national flag' and conditions attached by suppliers (for the IAEA there are limited exceptions, e.g. under certain non-NPT safeguards agreements). This is the purpose of bilateral safeguards agreements.

55. There have been four cases, all involving undeclared plutonium separation (reprocessing) or uranium enrichment activities, where the IAEA Board of Governors has found that the country concerned was in non-compliance with its safeguards agreement, and

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10 25 of the countries making up this total are EU member states.

reported the non-compliance to the Security Council in accordance with the IAEA Statute: Iraq in 1991, Romania in 1992, DPRK in 1993, and Libya in 2004. At the time of writing, the IAEA is continuing to investigate serious safeguards violations in Iran, and Board has not yet reached a conclusion.

56. None of these cases involved countries eligible to use Australian uranium, and none of these countries were operating nuclear power programs at the time.

57. The objective of Australia's safeguards requirements is to ensure that:

- AONM is appropriately accounted for as it moves through the nuclear fuel cycle;
- AONM is used only for peaceful purposes in accordance with the applicable agreements; and
- AONM in no way enhances or contributes to any military process.

58. The application of Australia's requirements starts with a careful selection of those countries eligible to receive AONM:

- it is a minimum requirement that, in the case of non-nuclear-weapon states, countries must meet the NPT full scope safeguards standard, that is, IAEA safeguards must apply to all existing and future nuclear activities;
- as I have announced, Australia will shortly make adherence to the IAEA's Additional Protocol a pre-condition for supply to Non-Nuclear Weapon States; and
- in the case of nuclear-weapon states, there must be a treaty level assurance that AONM will be used only for peaceful purposes, and arrangements must be in place under which AONM is subject to that state's safeguards agreement with the IAEA.

59. A basic requirement is the conclusion of a safeguards agreement between Australia and the country concerned, setting out the various conditions which apply to AONM. The principal conditions for the use of AONM set out in Australia's bilateral safeguards agreements are summarised as follows:

- an undertaking that AONM will be used only for peaceful purposes and will not be diverted to military or explosive purposes, and that IAEA safeguards will apply;
- none of the following actions can take place without Australia's prior consent:
  - transfers to third parties;
  - enrichment to 20% or more in the isotope uranium-235;
  - reprocessing[11];
- provision for fallback safeguards or contingency arrangements in case NPT or IAEA safeguards cease to apply in the country concerned;
- an assurance that internationally agreed standards of physical security will be applied to nuclear material in the country concerned;

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11 Consent has been given in advance to reprocessing on a programmatic basis in the case of five Agreements: Euratom, France, Japan, Sweden and Switzerland.

- detailed 'administrative arrangements' between ASNO and its counterpart organisation, setting out the procedures to apply in accounting for AONM;
- regular consultations on the operation of the agreement; and
- provision for the removal of AONM in the event of a breach of the agreement.

In this context 'military purpose' means nuclear weapons, nuclear explosive devices, depleted uranium munitions and military nuclear propulsion systems.

Programmatic consent

60. Under most of Australia's agreements, consent has been given in advance for transfers at the 'front-end' of the fuel cycle, i.e. prior to irradiation, from one Australian agreement partner to another in accordance with the conditions in the respective agreements. This is intended to save time and administrative work, compared with case-by-case approvals. These advance consents apply in circumstances where approval would have been given if consent had been requested on a case-by-case basis. Australia is free to revoke advance consents at any time if necessary.

61. As noted in footnote 11, for some agreements advance consent has also been given for reprocessing to take place. These consents allow reprocessing and associated 'back-end' transfers (e.g. transfers of irradiated fuel and nuclear material recovered from reprocessing), in accordance with a fuel cycle program agreed with Australia, hence the term 'programmatic consent'. Here too consents are given only in circumstances where consent would be given if sought on a case-by-case basis, and Australia is free to revoke advance consents at any time if necessary. There has been some ill-informed comment that programmatic consent is a diminution of Australian conditions. This is untrue and simply demonstrates ignorance of how the bilateral agreements function.

China

62. Australian officials are holding discussions with China to determine whether a safeguards agreement to enable supply of Australian uranium for China's growing nuclear power program might be concluded. There have been recent allegations that Australia's safeguards requirements would be watered down in such an agreement. This is absolutely not the case. If an agreement is concluded with China, it would closely follow existing agreements.

Is there risk of diversion of AONM in NWS?

63. Australia currently has safeguards agreements with four of the five NPT nuclear weapon states (UK, USA, France and the Russian Federation—China is the other NWS). Each of the four has large and active civil nuclear programs that are responsible for the production of a large proportion of their total energy needs (in the case of France 78%). In the case of these four NWS the uranium needs of their civil nuclear programs greatly outweigh the requirements for any military production, and in the early 1990s they announced that production of fissile material for nuclear weapons purposes had ceased.

64. There is no AONM in Russia. Each of the other three NWS provide Australia with detailed reporting on the disposition and use of AONM. These measures provide assurance that the AONM within their jurisdictions remains exclusively in peaceful use.

Possible diversion of AONM to 'dirty bombs'

65. The issue of 'dirty bombs', or radiation dispersion devices, relates more to radioactive material than to nuclear material. As noted above, Australia's conditions for supply of AONM include an assurance that internationally agreed standards of physical security will be applied to nuclear material in the country concerned. The current agreed international standard (referred to as INFCIRC/225/Rev. 4) specifically addresses issues related to the theft and/or sabotage of materials. ASNO believes that these requirements adequately address this issue.

Annex 1

Table: World nuclear electricity generation (at 14 April 2005)

Country	*Operating Reactors*	*Capacity (GWe)*	*% of Total Electricity in 2003*	*Reactors under Construction*	
				Number	*(GWe)*
USA	104	99.2	19.9		
France	59	63.4	77.7		
Japan	54	45.5	25.0	3	3.3
Russian Federation	31	21.7	16.5	4	3.8
Germany	18	20.7	28.1		
ROK	20	16.8	40.0		
UK	23	11.9	23.7		
Canada	17	12.1	12.5		
Ukraine	15	13.1	45.9	2	1.9
Sweden	11	9.5	49.6		
Spain	9	7.6	23.6		
China	9	6.6	2.2	2	2.0
Belgium	7	5.8	55.5		
Taiwan, China	6	4.9	21.5	2	2.6
Czech Republic	6	3.6	31.1		
Switzerland	5	3.2	39.7		
Bulgaria	4	2.7	37.7		
Finland	4	2.7	27.3		
India	14	2.6	3.3	9	4.1
Lithuania	1	1.2	79.9		
Slovak Republic	6	2.4	57.4		
Brazil	2	1.9	3.6		
South Africa	2	1.8	6.0		
Hungary	4	1.8	32.7		
Mexico	2	1.3	5.2		
Argentina	2	0.9	8.6	1	0.7
Romania	1	0.7	9.3	1	0.7
Slovenia	1	0.7	40.4		
Netherlands	1	0.5	4.5		
Armenia	1	0.4	35.5		
Pakistan	2	0.4	2.4		
Iran	-	-	-	1	0.9
DPRK	-	-	-	1	1.0
World total	441	367.2	(est) 17.0	25	19.9

In bold – bilateral agreement with Australia for the use of AONM (Taiwan is covered by an agreement between Australia and the United States). These countries operate 360 power reactors, accounting for 85% of world nuclear generating capacity.

Source: IAEA PRIS Database

Annex 2

Australia's Bilateral Safeguards Agreements and their dates of entry into force

Country[12]	*Date of EIF*
Republic of Korea (ROK)	2 May 1979
UK[13]	24 July 1979
Finland[13]	9 February 1980
USA	16 January 1981
Canada	9 March 1981
Sweden[13]	22 May 1981
France[13]	12 September 1981
Euratom[14]	15 January 1982
Philippines[15]	11 May 1982
Japan	17 August 1982
Switzerland	27 July 1988
Egypt[15]	2 June 1989
Russian Federation[16]	24 December 1990
Mexico	17 July 1992
New Zealand[17]	1 May 2000
Czech Republic[13]	17 May 2002
USA covering supply to Taiwan, China	17 May 2002
Hungary[13]	15 June 2002
Argentina	12 January 2005

12 This list does not include Australia's NPT safeguards agreement with the IAEA, concluded on 10 July 1974 (reproduced as Schedule 3 to the *Nuclear Non-Proliferation (Safeguards) Act 1987*). In addition to these Agreements, Australia also has an Exchange of Notes constituting an Agreement with Singapore Concerning Cooperation on the Physical Protection of Nuclear Materials, which entered into force on 15 December 1989). The texts of these Agreements are published in the Australian Treaty Series.

13 Czech Republic, Finland, France, Hungary, Sweden and the UK are members of Euratom and AONM in these countries is covered by the Australia/Euratom Agreement.

14 Euratom is the atomic energy agency of the European Union.

15 In the case of Egypt and the Philippines, Administrative Arrangements pursuant to the Agreements have not been concluded, so in practice the Agreements have not yet entered into operation.

16 The Australia/Russia Agreement covers the processing (conversion, enrichment or fuel fabrication) of AONM in Russia on behalf of other partner countries, but does not permit the use of AONM by Russia.

17 The Australia/New Zealand agreement covers the supply of uranium for non-nuclear use.

Annex 3

FUNDAMENTAL PRINCIPLES OF PHYSICAL PROTECTION OF NUCLEAR MATERIAL AND NUCLEAR FACILITIES

A. IAEA document GOV/2001/41, 15 August 2001

The following physical protection fundamental principles have to be considered as the basis for achieving the Physical Protection Objectives:

FUNDAMENTAL PRINCIPLE A: ***Responsibility of the State***

The responsibility for the establishment, implementation and maintenance of a physical protection regime within a State rests entirely with that State.

FUNDAMENTAL PRINCIPLE B: ***Responsibilities during International Transport***

The responsibility of a State for ensuring that nuclear material is adequately protected extends to international transport thereof until that responsibility is properly transferred to another State, as appropriate.

FUNDAMENTAL PRINCIPLE C: ***Legislative and Regulatory Framework***

The State is responsible for establishing and maintaining a legislative and regulatory framework to govern physical protection. This framework should provide for the establishment of applicable physical protection requirements and include a system of evaluation and licensing or other procedures to grant authorization. This framework should include a system of inspection of nuclear facilities and transport to verify compliance with applicable requirements and conditions of the license or other authorizing document, and to establish a means to enforce applicable requirements and conditions, including effective sanctions.

FUNDAMENTAL PRINCIPLE D: ***Competent Authority***

The State should establish or designate a competent authority which is responsible for the implementation of the legislative and regulatory framework, and is provided with adequate authority, competence and financial and human resources to fulfil! Its page 3 *assigned responsibilities. The State should take steps to ensure an effective independence[18] [19] between the functions of the State's competent authority and those of any other body in charge of the promotion or utilization of nuclear energy.*

FUNDAMENTAL PRINCIPLE E: ***Responsibility of the License Holders***

The responsibilities for implementing the various elements of physical protection within a State should be clearly identified. The State should ensure that the prime responsibility for the implementation of physical protection of nuclear material or of nuclear facilities rests with the holders of the relevant licenses or of other authorizing documents (e.g., operators or shippers).

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18 Effective independence means that organizational units, which are responsible for licensing and supervisory activities, are protected by regulatory or organizational means against any undue influence by other units or bodies on the execution of their tasks.

19 If the elements of the State's system of physical protection are divided between two or more authorities, arrangements should be made for overall co-ordination. Clear lines of responsibility should be established and recorded between the relevant entities.

FUNDAMENTAL PRINCIPLE F: ***Security Culture***[20]

All organizations involved in implementing physical protection should give due priority to the security culture, to its development and maintenance necessary to ensure its effective implementation in the entire organization.

FUNDAMENTAL PRINCIPLE G: ***Threat***

The State's physical protection should be based on the State's current evaluation of the threat.

FUNDAMENTAL PRINCIPLE H: ***Graded Approach***[21]

Physical protection requirements should be based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness, the nature of the material and potential consequences associated with the unauthorized removal of nuclear material and with the sabotage against nuclear facilities or nuclear material.

FUNDAMENTAL PRINCIPLE I: ***Defence in Depth***

The State's requirements for physical protection should reflect a concept of several layers and methods of protection (structural or other technical, personnel and organizational) that have to be overcome or circumvented by an adversary in order to achieve his objectives.

FUNDAMENTAL PRINCIPLE J: ***Quality Assurance***

A quality assurance policy and quality assurance programmes should be established and implemented with a view to providing confidence that specified requirements for all activities important to physical protection are satisfied

FUNDAMENTAL PRINCIPLE K: ***Contingency Plans***

Contingency (emergency) plans to respond to unauthorized removal of nuclear material or sabotage of nuclear facilities or nuclear material, or attempts thereof, should be prepared and appropriately exercised by all license holders and authorities concerned

FUNDAMENTAL PRINCIPLE L: ***Confidentiality***

The State should establish requirements for protecting the confidentiality of information, the unauthorized disclosure of which could compromise the physical protection of nuclear material and nuclear facilities.

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20 Security culture includes characteristics and attitudes in organizations and of individuals which establish that physical protection issues receive the attention warranted by their significance.

21 INFCIRC/225/Rev. 4 (Corrected), Section 4.2.5.1.

Annex 4

Acronyms

AONM	Australian Obligated Nuclear Material
ASNO	Australian Safeguards and Non-Proliferation Office
GWe	GigaWatts electrical
IAEA	International Atomic Energy Agency
MWe	MegaWatts electrical
NEA	Nuclear Energy Agency
NSG	Nuclear Suppliers Group
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NWS	Nuclear Weapons State(s)
NNWS	Non-Nuclear Weapons State(s)
OECD	Organization for Economic Cooperation and Development
PP	Physical Protection (of nuclear material)
TWh	TeraWatt hours
UOC	Uranium Ore Concentrates