AUSTRALIAN ATOMIC ENERGY COMMISSION

CONDITIONS APPLYING TO AUSTRALIAN URANIUM EXPORTS - SAFEGUARDS OBLIGATIONS UNDER NPT

by

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ABSTRACT

The Australian Government's expressed desire to inhibit the spread of nuclear weapons and its wish to prevent Australia's uranium exports being used for manufacture of nuclear explosives are underwritten by Australia's formal international obligations. Australia is not free to export its material without paying due regard to supra-national requirements.

This paper defines two safeguards regimes, one applying to countries such as Australia which are party to the Treaty on Non-Proliferation of Nuclear Weapons (NPT), the other to those which are not parties. The application of safeguards and the role of the International Atomic Energy Agency (IAEA) are briefly explained.

Australia's obligations under the NPT and those stemming from specific undertakings to the IAEA are stated. The latter require Australia to ensure that Non-Nuclear Weapons States not party to the NPT give assurances that Australian uranium will not be used for the manufacture of nuclear explosives and that they will permit verification by the IAEA. These obligations give rise to a set of minimum conditions applying to exports of Australian uranium which vary according to the NPT status of the importing countries.

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ACCOUNTING; AUSTRALIA; IAEA SAFEGUARDS; NON-PROLIFERATION TREATY; NUCLEAR MATERIALS DIVERSION; NUCLEAR WEAPONS; URANIUM.

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INTRODUCTION

In January 1973 the Australian Government ratified the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and in so doing undertook not to receive, control, manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices. It also undertook to accept safeguards on specified nuclear material within its own territory; these are described below, but essentially they are the means by which the International Atomic Energy Agency (IAEA) verifies that Australia is honouring its promises.

The Australian Government also undertook not to supply nuclear material to any Non-Nuclear Weapon State unless safeguards could be applied by the IAEA to Australian supplied material.

It is important to understand that the Australian Government's expressed desire to inhibit the spread of nuclear weapons and its wish to prevent Australia's uranium exports being used for manufacture of nuclear explosives are in fact underwritten by Australia's formal international obligations. Australia is not free to export its material without paying due regard to supra-national requirements.

NPT SAFEGUARDS

In order to verify that nuclear material is not being illicitly diverted to nuclear weapons or explosives, the Agency calls for Non-Nuclear Weapons States party to the NPT to enter into a Safeguards Agreement. Agency document INFCIRC/153 sets down the principles which guide the formulation of such agreements. It requires that a safeguards agreement should contain, amongst other things:

- An undertaking to accept safeguards on all nuclear material used for peaceful purposes.
- A provision for the Agency's right to apply safeguards.
- A promise to cooperate with the Agency.
- The establishment, by the State, of a national system of accounting and control of all nuclear material used for peaceful purposes.
- A promise to supply information to the Agency in so far as it is needed for verification.
- A promise to permit Agency inspectors access to records and the opportunity to check material in a real, physical sense.

The Australian Government entered into an NPT Safeguards Agreement with the Agency which came into force in July 1974 and it established the

Australian Safeguards Office. Countries such as Australia which enter into safeguards agreements based on document INFCIRC/153 are said to apply NPT safeguards.

INFCIRC/66/Rev.2 Safeguards

If countries have not ratified the NPT it is still possible for the IAEA to apply safeguards with their consent. The conditions are set out in Agency document INFCIRC/66/Rev.2. The essential difference between NPT safeguards and INFCIRC/66/Rev.2 safeguards is that the latter apply only to those nuclear activities which are agreed by the State and the Agency to be subject to safeguards. In short, they need not comprehend all nuclear material and activity within the State. It should be noted that INFCIRC/66/Rev.2 safeguards are aimed at verifying that nuclear material is not being diverted to further any military purpose. They do not explicitly prohibit peaceful nuclear explosives. This is an important distinction between the NPT and INFCIRC/66/Rev.2 safeguards and it calls for special measures, discussed below, to ensure that Australian uranium is not used for explosives.

Application of Safeguards

So far we have used the word 'safeguards' without explaining the ramifications of its meaning. We will now give a brief explanation of what is meant.

Human beings have been guarding valuables for centuries, so a considerable expertise exists on which to draw in order to set up a system which will protect them. In the past, however, it has been the owners who have been concerned to prevent illicit removal of their precious materials. Today, in safeguarding nuclear material, even the owners are not trusted and the IAEA checks that the owners themselves are not illicitly removing material for nefarious purposes.

When looking for means of ensuring that no illicit diversion takes place the first line of defence is clearly *containment*. It is directed to

(a) preventing unauthorised persons from gaining access to the nuclear materials; and

(b) preventing the unauthorised removal of the nuclear material whether by persons gaining unauthorised access or by persons having legitimate access to them.

Containment usually takes the form of physical barriers and/or guards who prevent unauthorised access or egress. Once the material is contained,

the protection offered by containment is reinforced by *surveillance* which is directed to:

(a) forestalling unauthorised removal of material, and

(b) demonstrating that material has not been removed.

Standard forms of surveillance are guards, the use of sensors to detect the removal of radioactive material, and the use of cameras to survey areas. In this technological age, sophisticated techniques of surveillance are available and are used.

Equally important, however, is *accountancy*. It remorselessly records the quantities of materials, their locations and their movements. At all times the records will show the disposition of the nuclear material, even though it passes through processing plants which change its form and concentration. They also show the history in terms of reactor exposure and calculate the extent to which uranium is burnt and plutonium created; subsequent analysis checks the results.

Transfers within a country and from one country to another are meticulously recorded by the State and reported to the IAEA.

IAEA officials have great experience, backed by practical knowledge, which enables them to subject records to statistical scrutiny to verify that no material is being diverted. They assess, for example, whether a loss of material is one to be reasonably expected from a process or whether there are grounds to suspect diversion. In addition to inspecting records and comparing one country's results with another's, they must also take a physical inventory which is mandatory and regarded as fundamentally important. They can and do see, weigh, analyse and test material to confirm to their satisfaction that the book entries are correct.

As a whole, containment, surveillance and accountancy, with inspections and physical inventories superimposed, make up what are known as safeguards. They make it extraordinarily difficult for anyone within a State and for any State itself to divert material without detection. The problem of theft, a special form of diversion, is described in the Information Paper, 'Illicit Diversion of Nuclear Materials' (AAEC/IP 6).

It should also be noted that safeguards are continually evolving; there are always newer, more effective, more accurate ways of doing things being developed and put into practice.

AUSTRALIA'S UNDERTAKINGS TO THE IAEA

Under Article III(2) of the NPT each State party to the Treaty undertakes not to provide: (a) source or special fissionable material, or

(b) equipment or material especially designed or prepared for processing, use or production of special fissionable material, to any Non-Nuclear Weapons State for peaceful purposes, unless the source or special fissionable material shall be subject to the safeguards required by the Article.

The wording of the Article leaves uncertainty on two points. Firstly, what is meant by 'equipment or material specially designed or prepared for the processing, use or production of special fissionable material' and second, what is meant by 'the safeguards required by this Article'. To resolve these questions, a widely representative group of both supplier and consumer nations held a series of meetings at which they reached common understandings. They decided that source and special fissionable material would be defined by Article XX of the IAEA Statute (copy attached as Appendix A) and that equipment and material would be defined according to a list they drew up, called a 'Trigger List'. Export of any item on the Trigger List would automatically invoke safeguards.

When the group addressed the question of what was meant by safeguards, it had to take account of the fact that while NPT countries would apply INFCIRC/153 safeguards, some importers may not be party to the NPT. The group decided that the safeguards regime to be applied to Non-Nuclear Weapons States which are not party to the Treaty should be that defined by INFCIRC/66/Rev.2. But, it knew that such a regime did not specifically exclude peaceful nuclear explosive use. Therefore it decided that a condition of supply to Non-Nuclear Weapons States not party to NPT would be an undertaking by them not to use source or special fissionable material for nuclear weapons or other nuclear explosive devices, and that INFCIRC/66/Rev.2 safeguards were to be applied and extended to verify that no diversion to explosives takes place.

When the group had concluded its work the Governments of Australia, Denmark, Canada, Finland, Norway, USSR, UK, USA, Northern Ireland, Poland, GDR and Hungary sent letters in 1974 to the Director General of the IAEA expressing their resolve. These letters are published in Agency document INFCIRC/209 and its addenda. The relevant extract is attached as Appendix B.

Safeguards Conditions Applying to Exports

Having reviewed the background of international obligations, understanding and safeguards, we can now consider the obligations at present resting on Australia in regard to exports of uranium. As mentioned earlier, new developments in safeguards are introduced from time to time and recently the NPT Review Conference has encouraged a further tightening

of safeguards requirements. But, for the present there are four categories of countries to which nuclear material may be exported:

1. Nuclear Weapons States (NWS) party to the NPT.
2. Nuclear Weapons States not party to the NPT.
3. Non-Nuclear Weapons States (NNWS) party to the NPT which have concluded with the IAEA and brought into force the safeguards agreement required by the NPT.
4. Non-nuclear Weapons States not party to the NPT or which are party to the NPT but have not brought into force the safeguards agreement required by the NPT.

The minimum conditions of export to each category are as follows:

Category 1

(e.g. USA, USSR, UK)

No conditions are required.

Category 2

(e.g. France)

The only condition is that the recipient country must provide satisfactory assurances that if it re-exports Australian uranium to a NNWS not party to the NPT then the material will not be used by the NNWS for the manufacture of nuclear weapons or explosives and will be subject to extended INFCIRC/66/Rev.2 safeguards.

Category 3

(e.g. Canada)

No conditions are required because the recipient country has exactly the same domestic and international obligations as Australia.

Category 4

(e.g. Japan)

The recipient country must agree not to use Australian uranium for any nuclear explosive and to INFCIRC/66/Rev.2 safeguards being applied and being extended to verify that no diversion to explosives takes place. It must also undertake not to re-export material to another NNWS not party to the NPT without ensuring that similar conditions will apply there.

The formal agreement of the recipient country can take more than one form. The safeguards conditions could be met by the recipient state entering into a bilateral safeguards agreement with the IAEA or, as is the case between Australia and Japan, entering into a trilateral safeguards

agreement with the IAEA. In both cases a supplementary Government to Government agreement on non-explosive use is required.

SUMMARY

The Australian Government has expressed its determination to do all it can to prevent the spread of nuclear weapons and explosives. It has entered into international commitments by which it is obliged to attach conditions to its exports. Of the non-nuclear weapons countries, only those which give assurances of no explosive use and allow the IAEA to verify that diversion is not taking place, will be supplied by Australia.

APPENDIX A

ARTICLE XX AS GIVEN IN THE IAEA STATUTE

ARTICLE XX *Definitions*

As used in this Statute:

1. The term "special fissionable material" means plutonium-239; uranium-233; uranium enriched in the isotopes 235 or 233; any material containing one or more of the foregoing; and such other fissionable material as the Board of Governors shall from time to time determine; but the term "special fissionable material" does not include source material.

2. The term "uranium enriched in the isotopes 235 or 233" means uranium containing the isotopes 235 or 233 or both in an amount such that the abundance ratio of the sum of these isotopes to the isotope 238 is greater than the ratio of the isotope 235 to the isotope 238 occurring in nature.

3. The term "source material" means uranium containing the mixture of isotopes occurring in nature; uranium depleted in the isotope 235; thorium; any of the foregoing in the form of metal, alloy, chemical compound, or concentrate; any other material containing one or more of the foregoing in such concentration as the Board of Governors shall from time to time determine; and such other material as the Board of Governors shall from time to time determine.

APPENDIX B

UNDERTAKING BY THE GOVERNMENT OF AUSTRALIA

AS PUBLISHED IN IAEA DOCUMENT INFCIRC/209

1. The Government has had under consideration procedures in relation to exports of nuclear materials in the light of its commitment not to provide source or special fissionable material to any non-nuclear-weapon State for peaceful purposes unless the source or special fissionable material is subject to safeguards under an agreement with the International Atomic Energy Agency.

DEFINITION OF SOURCE AND SPECIAL FISSIONABLE MATERIAL

2. The definition of source and special fissionable material adopted by the Government shall be that contained in Article XX of the Agency's Statute. [1]

THE APPLICATION OF SAFEGUARDS

3. The Government is solely concerned with ensuring, where relevant, the application of safeguards in non-nuclear-weapon States not party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)[2] with a view to preventing diversion of the safeguarded nuclear material from peaceful purposes to nuclear weapons or other nuclear explosive devices. If the Government wishes to supply source or special fissionable material for peaceful purposes to such a State, it will:

(a) Specify to the recipient State, as a condition of supply, that the source or special fissionable material, or special fissionable material produced in or by the use thereof, shall not be diverted to nuclear weapons or other nuclear explosive devices; and

(b) Satisfy itself that safeguards to that end, under an agreement with the Agency and in accordance with its safeguards system, will be applied to the source or special fissionable material in question.

DIRECT EXPORTS

4. In the case of direct exports of source or special fissionable material to non-nuclear-weapon States not party to NPT, the Government will satisfy itself, before authorizing the export of the material in question, that such material will be subject to a safeguards agreement with the Agency, as soon as the recipient State takes over responsibility for the material, but no later than the time the material reaches its destination.

RETRANSFERS

5. The Government, when exporting source or special fissionable material to a nuclear-weapon State not party to NPT, will require satisfactory assurances that the material will not be re-exported to a non-nuclear-weapon State not party to NPT unless arrangements corresponding to those referred to above are made for the acceptance of safeguards by the State receiving such re-export.

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[1] See also para. 6 below.

[2] Reproduced in document INFCIRC/140.

MISCELLANEOUS

6. Exports of the items specified in sub-paragraph (a) below, and exports of source or special fissionable material to a given recipient country, within a period of 12 months, below the limits specified in sub-paragraph (b) below, shall be disregarded for the purpose of the procedures described above:

(a) Plutonium with an isotopic concentration of plutonium-238 exceeding 80%;

Special fissionable material when used in gram quantities or less as a sensing component in instruments; and

Source material which the Government is satisfied is to be used only in non-nuclear activities, such as the production of alloys or ceramics;

(b) Special fissionable material	50 effective grams;
Natural uranium	500 kilograms;
Depleted uranium	1000 kilograms; and
Thorium	1000 kilograms.

MEMORANDUM B

INTRODUCTION

1. The Government has had under consideration procedures in relation to exports of certain categories of equipment and material, in the light of its commitment not to provide equipment or material especially designed or prepared for the processing, use or production of special fissionable material to any non-nuclear-weapon State for peaceful purposes, unless the source or special fissionable material produced, processed or used in the equipment or material in question is subject to safeguards under an agreement with the International Atomic Energy Agency.

THE DESIGNATION OF EQUIPMENT OR MATERIAL ESPECIALLY DESIGNED OR PREPARED FOR THE PROCESSING, USE OR PRODUCTION OF SPECIAL FISSIONABLE MATERIAL

2. The designation of items of equipment or material especially designed or prepared for the processing, use or production of special fissionable material (hereinafter referred to as the "Trigger List") adopted by the Government is as follows (quantities below the indicated levels being regarded as insignificant for practical purposes):

2.1. Reactors and equipment therefor:

2.1.1. Nuclear reactors capable of operation so as to maintain a controlled self-sustaining fission chain reaction, excluding zero energy reactors, the latter being defined as reactors with a designed maximum rate of production of plutonium not exceeding 100 grams per year.

2.1.2. Reactor pressure vessels:

Metal vessels, as complete units or as major shop-fabricated parts therefor, which are especially designed or

prepared to contain the core of a nuclear reactor as defined in paragraph 2.1.1 above and are capable of withstanding the operating pressure of the primary coolant.

2.1.3. Reactor fuel charging and discharging machines:

Manipulative equipment especially designed or prepared for inserting or removing fuel in a nuclear reactor as defined in paragraph 2.1.1 above capable of on-load operation or employing technically sophisticated positioning or alignment features to allow complex off-load fuelling operations such as those in which direct viewing of or access to the fuel is not normally available.

2.1.4. Reactor control rods:

Rods especially designed or prepared for the control of the reaction rate in a nuclear reactor as defined in paragraph 2.1.1 above.

2.1.5. Reactor pressure tubes:

Tubes which are especially designed or prepared to contain fuel elements and the primary coolant in a reactor as defined in paragraph 2.1.1 above at an operating pressure in excess of 50 atmospheres.

2.1.6. Zirconium tubes:

Zirconium metal and alloys in the form of tubes or assemblies of tubes, and in quantities exceeding 500 kg, especially designed or prepared for use in a reactor as defined in paragraph 2.1.1 above, and in which the relationship of hafnium to zirconium is less than 1:500 parts by weight.

2.1.7. Primary coolant pumps:

Pumps especially designed or prepared for circulating liquid metal as primary coolant for nuclear reactors as defined in paragraph 2.1.1 above.

2.2. Non-nuclear materials for reactors:

2.2.1. Deuterium and heavy water:

Deuterium and any deuterium compound in which the ratio of deuterium to hydrogen exceeds 1:5000 for use in a nuclear reactor as defined in paragraph 2.1.1 above in quantities exceeding 200 kg of deuterium atoms for any one recipient country in any period of 12 months.

2.2.2. Nuclear grade graphite:

Graphite having a purity level better than 5 parts per million boron equivalent and with a density greater than 1.50 grams per cubic centimetre in quantities exceeding 30 metric tons for any one recipient country in any period of 12 months.

2.3.1. Plants for the reprocessing of irradiated fuel elements, and equipment especially designed or prepared therefor.

2.4.1. Plants for the fabrication of fuel elements.

2.5.1. Equipment, other than analytical instruments, especially designed or prepared for the separation of isotopes of uranium.

Clarifications of certain of the items on the above list are annexed.

THE APPLICATION OF SAFEGUARDS

3. The Government is solely concerned with ensuring, where relevant, the application of safeguards in non-nuclear-weapon States not party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)[1] with a view to preventing diversion of the safeguarded nuclear material from peaceful purposes to nuclear weapons or other nuclear explosive devices. If the Government wishes to supply Trigger List items for peaceful purposes to such a State, it will:

(a) Specify to the recipient State, as a condition of supply, that the source or special fissionable material produced, processed or used in the facility for which the item is supplied shall not be diverted to nuclear weapons or other nuclear explosive devices; and

(b) Satisfy itself that safeguards to that end, under an agreement with the Agency and in accordance with its safeguards system, will be applied to the source or special fissionable material in question.

DIRECT EXPORTS

4. In the case of direct exports to non-nuclear-weapon States not party to NPT, the Government will satisfy itself, before authorizing the export of the equipment or material in question, that such equipment or material will fall under a safeguards agreement with the Agency.

RETRANSFERS

5. The Government, when exporting Trigger List items, will require satisfactory assurances that the items will not be re-exported to a non-nuclear-weapon State not party to NPT unless arrangements corresponding to those referred to above are made for the acceptance of safeguards by the State receiving such re-export.

MISCELLANEOUS

6. The Government reserves to itself discretion as to interpretation and implementation of its commitment referred to in paragraph 1 above and the right to require, if it wishes, safeguards as above in relation to items it exports in addition to those items specified in paragraph 2 above.

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[1] Reproduced in document INFCIRC/140.

ANNEX

CLARIFICATIONS OF ITEMS ON THE TRIGGER LIST

A. Complete nuclear reactors

(Item 2.1.1 of the Trigger List)

1. A "nuclear reactor" basically includes the items within or attached directly to the reactor vessel, the equipment which controls the level of power in the core, and the components which normally contain or come in direct contact with or control the primary coolant of the reactor core.

2. The export of the whole set of major items within this boundary will take place only in accordance with the procedures of the memorandum. Those individual items within this functionally defined boundary which will be exported only in accordance with the procedures of the memorandum are listed in paragraphs 2.1.1 to 2.1.5. Pursuant to paragraph 6 of the memorandum, the Government reserves to itself the right to apply the procedures of the memorandum to other items within the functionally defined boundary.

3. It is not intended to exclude reactors which could reasonably be capable of modification to produce significantly more than 100 grams of plutonium per year. Reactors designed for sustained operation at significant power levels, regardless of their capacity for plutonium production, are not considered as "zero energy reactors".

B. Pressure vessels

(Item 2.1.2 of the Trigger List)

4. A top plate for a reactor pressure vessel is covered by item 2.1.2 as a major shop-fabricated part of a pressure vessel.

5. Reactor internals (e.g. support columns and plates for the core and other vessel internals, control rod guide tubes, thermal shields, baffles, core grid plates, diffuser plates, etc.) are normally supplied by the reactor supplier. In some cases, certain internal support components are included in the fabrication of the pressure vessel. These items are sufficiently critical to the safety and reliability of the operation of the reactor (and, therefore, to the guarantees and liability of the reactor supplier), so that their supply, outside the basic supply arrangement for the reactor itself, would not be common practice. Therefore, although the separate supply of these unique, especially designed and prepared, critical, large and expensive items would not necessarily be considered as falling outside the area of concern, such a mode of supply is considered unlikely.

C. Reactor control rods

(Item 2.1.4 of the Trigger List)

6. This item includes, in addition to the neutron absorbing part, the support or suspension structures therefor if supplied separately.

D. Fuel reprocessing plants

(Item 2.3.1 of the Trigger List)

7. A "plant for the reprocessing of irradiated fuel elements" includes the equipment and components which normally come in direct contact with and directly control the irradiated fuel and the major nuclear material and fission product processing streams. The export of the whole set of major items within this boundary will take place only in accordance with the

procedures of the memorandum. In the present state of technology only two items of equipment are considered to fall within the meaning of the phrase "and equipment especially designed or prepared therefor". These items are:

(a) Irradiated fuel element chopping machines: remotely operated equipment especially designed or prepared for use in a reprocessing plant as identified above and intended to cut, chop or shear irradiated nuclear fuel assemblies, bundles or rods; and

(b) Critically safe tanks (e.g. small diameter, annular or slab tanks) especially designed or prepared for use in a reprocessing plant as identified above, intended for dissolution of irradiated nuclear fuel and which are capable of withstanding hot, highly corrosive liquid, and which can be remotely loaded and maintained.

8. Pursuant to paragraph 6 of the memorandum, the Government reserves to itself the right to apply the procedures of the memorandum to other items within the functionally defined boundary.

E. Fuel fabrication plants

(Item 2.4.1 of the Trigger List)

9. A "plant for the fabrication of fuel elements" includes the equipment:

(a) Which normally comes in direct contact with, or directly processes, or controls, the production flow of nuclear material, or

(b) Which seals the nuclear material within the cladding.

10. The export of the whole set of items for the foregoing operations will take place only in accordance with the procedures of the memorandum. The Government will also give consideration to application of the procedures of the memorandum to individual items intended for any of the foregoing operations, as well as for other fuel fabrication operations, such as checking the integrity of the cladding or the seal, and the finish treatment to the solid fuel.

F. Isotope separation plant equipment

(Item 2.5.1 of the Trigger List)

11. "Equipment, other than analytical instruments, especially designed or prepared for the separation of isotopes of uranium" includes each of the major items of equipment especially designed or prepared for the separation process.