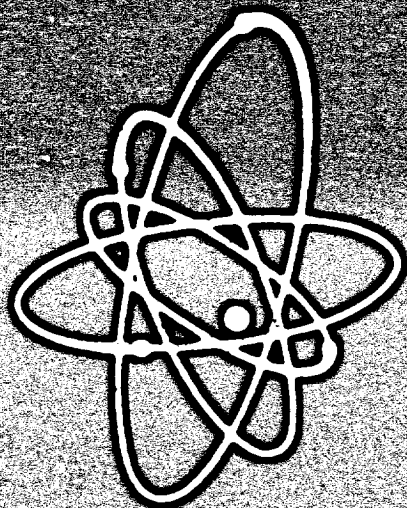


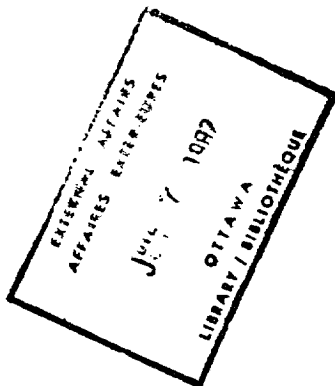
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Canada's nuclear
non-proliferation
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I Introduction

Whatever else the second half of the twentieth century will come to be symbolized by, the unlocking of the power in the atom will be seen as one of the half dozen or so most significant developments. This power was demonstrated close to the mid-point of the century. There is no turning back the clock. Atomic energy is with us to stay.

It is common knowledge that energy can be released from splitting atoms both suddenly in an explosion and gradually in a nuclear reactor that has mechanisms controlling the rate of the chain reaction. Nuclear explosive devices are not particularly easy to make, nor are nuclear reactors, but there has always been a legitimate concern that nuclear reactors could assist in the development of a nuclear explosive device and, therefore, that nuclear reactors could lead to a proliferation of nuclear weapons. The question that has preoccupied many governments and individuals since nuclear energy was first shown to be viable is how to harness the energy in the atom while preventing the proliferation of nuclear weapons.

A great deal has been written about nuclear proliferation and nuclear non-proliferation since the first detonation of a nuclear explosive device in 1945. This paper can at best provide a brief summary of the main events. The high point in the history of non-proliferation is of course the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) (1968-70). The establishment of the International Atomic Energy Agency (the IAEA or "The Agency") in 1957 is also highly significant, especially since it is the international body that is responsible for onsite inspections and safeguards measures that assist the member states of the Agency to demonstrate that no nuclear material is diverted to non-peaceful purposes from safeguarded nuclear facilities. Besides these international efforts, many countries that supply nuclear related materials, equipment or technology have developed national policies that they apply to the export of such nuclear items. The purpose of this paper, therefore, is to describe the development of Canada's non-proliferation policy since 1945 and to explain its current highly articulated state in the wider context of the developing international non-proliferation régime.

Before briefly tracing the evolution of the current non-proliferation régime, and of Canada's non-proliferation policy as one part of that régime, one clarifying observation should be made. International efforts to minimize the risk of nuclear proliferation have taken place against the background of the spread of nuclear explosive capability, from the United States in 1945 and the Soviet Union in 1949 to the United Kingdom and France in the 1950s and the People's Republic of China in the early 1960s. As a result, two types of proliferation have generally been designated: "horizontal" proliferation, which refers to the spread of nuclear explosive capability beyond the five Nuclear Weapon States (NWS) identified above; and "vertical" proliferation, which refers to the growth of the nuclear explosive programs of the five NWS. This paper deals only with the evolution of the international non-proliferation régime designed to respond to the threat of horizontal proliferation.

A risk of horizontal proliferation emerges from the possibility that the nuclear material, facilities and technology used in nuclear research and in the power-generating industry might be diverted or misused to develop a nuclear explosive device. A major consideration is that the proliferation of nuclear weapons is one important factor in global and, even more so, in regional security, although it is not necessarily the most critical factor. The essential determinant of proliferation is the degree of political incentive or disincentive (rather than the technical means) which countries face. Thus, while diversion of nuclear items from the civilian nuclear fuel cycle is one possible technical route to the development of nuclear explosive devices, it is not the only, nor the most efficient, route. A political decision to proliferate would be better served by installing facilities dedicated solely to that objective. Controls on the diversion of nuclear items from civilian facilities are necessary, but it is clear that if a country has a sufficient political incentive, such controls would by themselves not stop that country. Any industrialized country and many developing countries could develop, if they so decided, a nuclear explosive capability. A general political commitment by a country not to proliferate is, therefore, as important as the specific controls that prevent diversion.

II Treaty on the Non-Proliferation of Nuclear Weapons

The immediate postwar period was a time in which the states involved in the Manhattan Project (the United States, the United Kingdom and Canada) and others tried to formulate a way of "entirely eliminating the use of atomic energy for destructive purposes and promoting its wider use for industrial and humanitarian purposes" ("Agreed Declaration on Atomic Energy", November 1945). In January 1946, after discussions between the United States, the United Kingdom and the Soviet Union, the United Nations passed a resolution creating the United Nations Atomic Energy Commission. Meanwhile, the United States adopted a national policy on atomic power, which was reflected in its Atomic Energy Act of 1946 and which placed an embargo on the export of nuclear materials and information.

During these years, however, it became evident that it would not be possible to prevent the spread of nuclear technology. This fact was recognized in the "Report of the International Control of Atomic Energy" (the "Acheson-Lilienthal Report"), which was prepared by a group under the leadership of Dean Acheson and David Lilienthal. President Eisenhower's speech to the UN General Assembly in December 1953 proposing the establishment of an international agency which would be devoted entirely to the peaceful uses of nuclear energy marked a further step in this process. On December 4, 1954, the General Assembly unanimously adopted an "Atoms for Peace" resolution calling for the establishment of such an agency. After two years of negotiations, the Statute of the International Atomic Energy Agency (IAEA) was unanimously approved and signed in October 1956. It came into force on July 29, 1957. It should be added here that one of the IAEA's functions, as stated in its Statute, is "to establish and administer safeguards designed to ensure that special fissionable and other materials...are not used in such a way as to further any military purpose". The application of safeguards by the IAEA has from the beginning been one of the fundamental tenets of Canada's non-proliferation and safeguards policy and the nuclear co-operation agreements that Canada has put into place with its various

nuclear partners all call for such IAEA safeguards. The word "safeguards" therefore has a special meaning. (See Section VII for an exposition of the IAEA Safeguards System.)

Thus international efforts to promote non-proliferation in the post-1957 period were based on the two principles first written in the November 1945 "Agreed Declaration on Atomic Energy" and later incorporated into the Statute of the IAEA: to eliminate the use of atomic energy for destructive ends and at the same time to promote its use in such fields as agriculture, industry, medicine and the generation of electricity. Since then, efforts to support the non-proliferation goal have been dominated by the question of how to achieve a proper balance between measures to advance these two principles.

By 1965 five states had nuclear arms, and there were signs that more states were moving toward acquiring such weapons. As early as 1958, Ireland had submitted a resolution to the UN General Assembly expressing concern over this trend. Growing international concern finally resulted in the negotiation of the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT). By 1970, 40 countries, including three of the five NWSs (the United States, the United Kingdom and the Soviet Union), had ratified the NPT, which then became effective on March 5 of that year.

The NPT had built into it a distinction between Nuclear-Weapon States (NWS) and Non-Nuclear-Weapon States (NNWS) which recognized the unique status of the five states (the United States, the Soviet Union, the United Kingdom, France and the People's Republic of China) which had manufactured and exploded a nuclear weapon before January 1, 1967. Many states viewed this distinction as discriminatory because the obligations placed on NWS and NNWS parties to the NPT are significantly different. NWS do not have to accept IAEA safeguards (although the United States, the United Kingdom and France have moved in this direction), while NNWS are required to accept IAEA safeguards on all source or special fissionable material under their control. However, under Article VI of the NPT, NWS obliged themselves to pursue negotiations in good faith on effective measures relating to the early cessation of the nuclear arms race and to nuclear disarmament.

III Canadian nuclear relations until 1974

Canada was one of the three states that participated in the November 1945 "Agreed Declaration on Atomic Energy". Throughout the years that followed, Canada played an active and significant role in efforts to define an international régime which would serve the twin principles set forth in the Declaration. Hence Canada participated both in the drafting of the IAEA's Statute between April 1955 and October 1956 and in the Preparatory Commission appointed to make arrangements for the first sessions of the IAEA's General Conference and of its Board of Governors. Canada has had continuous representation on the Board of Governors since the founding of the IAEA and has strongly supported the Agency's efforts on nuclear safeguards. Canadian representatives were also involved in the negotiations of the Treaty on the Non-Proliferation of Nuclear Weapons.

While participating in the efforts to define an international non-proliferation régime, Canada's policy on horizontal proliferation evolved. This evolution reflected both international developments and the emergence of Canada's own nuclear technology.

At the end of the Second World War, Canada shifted its efforts from the weapons-oriented Manhattan Project to research and development for peaceful applications, to radionuclide production, and to the development of a commercial nuclear reactor for the generation of electricity. The Canadian government pledged voluntarily that it would not develop nuclear weapons. As knowledge, experience and awareness of nuclear technology increased in Canada and elsewhere, and as vertical proliferation took place through the 1950s and early 1960s, successive Canadian governments revised Canada's policy to minimize the risk that Canadian nuclear co-operation would contribute to nuclear proliferation.

Early in the 1945-1974 period Canada's interactions with other countries on nuclear matters were in two main areas: uranium exports and continuing technical co-operation with its wartime partners. However, as its reactor technology developed, Canada entered into agreements with several other countries for the transfer of that technology and related material and equipment. By 1974, Canada had exported research reactors to India and Taiwan, power reactors to India and Pakistan, and

had signed a contract for the export of a 600 MW power reactor to Argentina. Discussions had also taken place concerning the sale of a power reactor to the Republic of Korea. Canadian nuclear trade during the 1945-1974 period was as follows:

(a) Uranium exports

Canada's uranium exports during the 1945-1974 period were carried out under nuclear co-operation agreements (Canada-Federal Republic of Germany in 1957; Canada-Switzerland in 1958; Canada-Euratom in 1959; Canada-Japan in 1959; Canada-Sweden in 1962) which made Canada's uranium exports subject to a "peaceful uses" commitment and to acceptance by the importing country of bilateral verification measures by Canada or, increasingly, through IAEA safeguards.

From 1945 to 1965, Canada also exported uranium to the United States and the United Kingdom for use in their nuclear weapons programs. These export sales were carried out as part of Canada's defence relations with those two countries. This policy was ended in June 1965, when Prime Minister Lester B. Pearson, announced in the House of Commons that:

"As one part of its policy to promote the use of Canadian uranium for peaceful purposes the government has decided that export permits will be granted, or commitments to issue export permits will be given, with respect to sales of uranium covered by contracts entered into from now on, only if the uranium is to be used for peaceful purposes. Before such sales to any destination are authorized the government will require an agreement with the government of the importing country to ensure with appropriate verification and control that the uranium is to be used for peaceful purposes only."

With the announcement of this policy, all Canadian uranium exports became subject to a "peaceful uses" provision.

(b) India

In 1956, Canada concluded an agreement to supply a research reactor to India as part of its aid program to that country. This reactor, the CIRUS, was provided subject to assurances that it would be used for peaceful purposes only. The United States provided the heavy water. The provision of this reactor and subsequent nuclear co-operation between Canada and India were concrete demonstrations of Canada's desire to promote the principles set forth in the IAEA Statute and later in the NPT regarding the transfer of nuclear materials, equipment and technology for peaceful uses.

In 1963 Canada and India concluded an agreement for the construction of the first unit of a nuclear power station called the Rajasthan

Atomic Power Plant (RAPP I). Under this agreement, India committed itself to using the fissionable material produced in the RAPP 1 reactor "only for peaceful purposes" and agreed that Canadian technical experts could verify this undertaking. In 1966 a second CANDU unit (RAPP II) was sold to India. Under a Canada-India-IAEA agreement concluded in 1971, the IAEA assumed the responsibility for applying safeguards at RAPP.

During the early 1970s Canada's concern that the plutonium contained in the fuel irradiated in the CIRUS reactor might be used for explosive purposes led the Prime Minister to write to Prime Minister Indira Gandhi in October 1971 to clarify Canada's views on "any further proliferation of nuclear explosive devices" and to state that "the use of Canadian-supplied material, equipment and facilities in India, that is, at CIRUS, RAPP I or RAPP II, or fissile material from these reactors, for the development of a nuclear explosive device would inevitably call on our part for a reassessment of our nuclear co-operation arrangements with India". In response, Mrs. Gandhi agreed that the nuclear co-operation between Canada and India had been dedicated to "the development and application of nuclear energy for peaceful purposes", but added that "it should not be necessary now in our view to interpret these agreements in a particular way based on the development of a hypothetical contingency".

On May 18, 1974, India detonated a nuclear explosive device, claiming it was solely for peaceful purposes, that is, a "peaceful nuclear explosion" (PNE). The Canadian government, which does not distinguish between nuclear weapons and nuclear explosives, suspended its nuclear co-operation program with India. Later, India admitted that plutonium produced in the CIRUS reactor using uranium fuel of non-Canadian origin had been used in that explosive device. It continues to maintain, however, that since nuclear material of non-Canadian origin was used, there has been no breach of its undertakings to Canada.

(c) Pakistan

In 1959, Canada signed a nuclear co-operation agreement with Pakistan covering the provision of a 137 MW CANDU-type power reactor (KANUPP). The agreement was similar to that concluded later between Canada and India for the RAPP reactors. In 1969 Canada, Pakistan and the IAEA concluded an agreement under which the IAEA assumed the responsibility of safeguarding the KANUPP reactor. The reactor began commercial operation in 1972.

(d) Taiwan

In 1969, Canada sold to Taiwan a 40 MW nuclear research reactor, the

Taiwan Research Reactor (TRR), complete with heavy water and fuel. This sale was conditional on Taiwan's concluding with the IAEA a safeguards agreement by which Taiwan would undertake not to use the TRR reactor in such a way as to further any military purpose. This agreement continues to be implemented, and the TRR reactor remains subject to IAEA safeguards.

(e) Argentina

In December 1973, Atomic Energy of Canada Limited and the Comision Nacional de Energia Atomica (CNEA) signed a contract for the supply of one 600 MW CANDU reactor to Argentina together with the fuel, heavy water and technology necessary for its commissioning, operation and maintenance. The December 1973 contract contained a clause requiring the completion of a safeguards agreement between Argentina and the IAEA before the contract could be implemented. This agreement was concluded in December 1974.

IV Nuclear suppliers group

Two developments in the mid-1970s led to a questioning of the non-proliferation régime. First, the interest in nuclear energy, particularly in advanced nuclear technologies, increased greatly owing to the "energy crisis" of 1973-74. The quest for greater energy independence by many industrialized countries and several developing ones, especially those with nuclear power programs that were without large indigenous uranium reserves, led to much more interest in reprocessing spent fuel to obtain plutonium for recycling in thermal reactors or for eventual use in fast breeder reactors. "Reprocessing" is basically a series of chemical processes in which spent fuel is first dissolved in an acid. Subsequently, substances of value that were produced in the reactor such as plutonium, or uranium that was not consumed while it was in the reactor, are extracted and separated for further use. Plutonium is itself a nuclear fuel that can be used in both traditional reactors as well as in fast breeder reactors. A fast breeder reactor is one that has a plutonium core surrounded by a uranium shell. In the course of operations, the plutonium is consumed but new plutonium is produced from the uranium in the shell. Thus the plutonium "breeds" new plutonium which in turn can be used as fuel.

It was generally agreed that the separation of plutonium from spent fuel and its subsequent use in recycling was a natural feature of an efficient light-water reactor fuel cycle. Moreover, the reprocessing of spent fuel was considered as an element of policy in the nuclear waste disposal programs of some countries and as a necessary step in the expected development of fast breeder reactors. In fact, the United States had declassified its reprocessing technology in recognition of this general understanding. Some of the other countries which had developed an indigenous reprocessing technology concluded that the export of that technology under IAEA safeguards was acceptable and, accordingly, entered into contracts to do so. However, because reprocessing released large quantities of plutonium, many people felt uneasy about the procedure. It was by no means clear in the mid-1970s whether or how reprocessing could be adequately safeguarded.

The second development which led to a serious questioning of the non-proliferation régime was India's "peaceful nuclear explosion" in May 1974 which had used plutonium derived from the reprocessing of spent fuel from an unsafeguarded research reactor. To some countries, this incident revealed the need for more explicit and comprehensive non-proliferation commitments. Specifically, steps would have to be taken to minimize the (perceived) proliferation risk associated with reprocessing.

It was in this international environment that the major nuclear suppliers — the Nuclear Suppliers Group (NSG) — met in an effort to reach agreement on "guidelines" to cover their nuclear exports. This meeting was convened largely in response to a Canadian and U.S. initiative. The resulting guidelines, which were published in a January 1978 information circular issued by the IAEA (INFCIRC/254) clearly represent a high-point in international co-operation with respect to non-proliferation. The guidelines augment the principles of the IAEA Statute and the NPT and constitute a significant upgrading in the attention to be paid to non-proliferation in the context of international nuclear commerce.

The important elements of the NSG guidelines are:

- a) items on the NSG "Trigger List", that is, the defined list of nuclear items that should trigger the application of the requirements of the guidelines, are to be transferred only upon an assurance that they will not be used in any activity that would result in a nuclear explosive device;
- b) Trigger List items should be transferred only when covered by IAEA safeguards;
- c) technology related to reprocessing, enrichment or heavy water production facilities should be subject to the requirements in a) and b);
- d) special controls and considerations should be applied to the export of "sensitive technologies", that is, enrichment and reprocessing technologies and to the export of enrichment and reprocessing plants;
- e) transfers of reprocessing, enrichment or heavy water production facilities or related technology would require that IAEA safeguards be applied to facilities of the same type built during an agreed upon period in the recipient country;
- f) retransfers of Trigger List items should take place only when *assurances* have been given by the third party which are the same as those covering the original transfer;
- g) retransfers of reprocessing, enrichment or heavy water produc-

tion facilities, major critical components thereof or related technology should require *consent* of the original supplier. The same prior consent would be applied to derived facilities or major critical components thereof and to any heavy water or weapons-usable material.

Canada has followed the NSG guidelines in good faith and they are incorporated in all bilateral agreements that have been concluded to date. The guidelines are in fact a subset of Canadian policy.

V Canada's non-proliferation policy

Canada was one of those countries in which the public's perception of the proliferation risk associated with nuclear exports sharpened after India's "peaceful nuclear explosion" in May 1974. Accordingly, Canada's non-proliferation policy was reviewed and in December 1974 the government announced stricter controls on the export of Canadian nuclear material, equipment, technology and heavy water to all states whether NWS or NNWS. The policy continued to be under examination and in December 1976 another announcement was made concerning new nuclear co-operation. These two announcements together established Canada's non-proliferation policy as it exists today. That policy, in a consolidated form, is as follows:

A. Nuclear co-operation will be authorized only for those non-nuclear weapon states that have made a general commitment to non-proliferation by either having ratified the NPT or having taken an equivalent binding step and that have thereby accepted IAEA safeguards on the full scope of their nuclear activities (such IAEA safeguards are hence known as NPT-type fullscope safeguards).

B. Nuclear exports can go forward only to those states (both non-nuclear and nuclear weapon states) which have undertaken to accept in a formal agreement a number of additional requirements designed to minimize the proliferation risk associated with Canadian nuclear exports. These requirements are:

- i) an assurance that Canadian-supplied nuclear items (nuclear material, heavy water, nuclear equipment and technology) will not be used in connection with the production of nuclear explosive devices;
- ii) a provision for fallback safeguards in the event that a situation arises where the IAEA is unable to continue to perform its safeguards functions;
- iii) a control over the retransfer of Canadian-supplied nuclear items;
- iv) a control over the reprocessing of Canadian-origin spent fuel, subsequent storage of the separated plutonium and enrichment beyond 20 per cent U-235 of Canadian-origin uranium;

- v) an assurance that adequate physical protection measures will be applied.

The above requirements are applied to directly-supplied nuclear items such as nuclear material, equipment, heavy water and technology. The requirements are also applied to nuclear items that are "derived" from those that are supplied and thus affect nuclear material that is produced as a result of the use of Canadian-origin nuclear material, equipment, technology or heavy water. Where applicable, the requirements are also applied to heavy water that is produced as a result of the use of Canadian-origin nuclear equipment or technology and to nuclear equipment that is derived from Canadian-origin nuclear equipment or technology.

Chronologically, Part A of the policy is the more recent component. The requirement for NPT adherence and fullscope safeguards was made by the government in December 1976. This requirement was made applicable only to "new" nuclear co-operation, that is, it did not affect commercial contracts already in place when this requirement was announced. Post-December 1976 or "new" nuclear co-operation, however, cannot occur with countries that do not meet this fundamental requirement. Part B of the policy was established by the government in December 1974 and affected all nuclear co-operation whether "old" or "new". Agreements under which nuclear co-operation was ongoing in 1974 thus had to be renegotiated.

It is worth noting that the NSG guidelines, mentioned in the preceding section, fall short of Canada's national non-proliferation policy in several ways. First, Canada advocated forcefully, but unsuccessfully, in the NSG forum the inclusion of a requirement that recipient countries adhere to the NPT and accept the application of NPT-type fullscope safeguards. This requirement would have strengthened the NPT and would have provided positive incentive for countries engaged in, or envisaging a nuclear power program to become party to this important international treaty. Another major difference is that Canada requires a control over reprocessing, whereas the NSG guidelines only recommend that "whenever appropriate and practicable" the supplier and recipient come to mutually agreed upon provisions. Other shadings of difference relate to controls placed over the retransfer of nuclear items to third parties.

The rationale for each of the requirements in Part B is as follows:

i) Non-explosive use commitment

For non-nuclear weapon states that already meet the requirements of Part A, this provision requires no additional commitment. It is essentially a contingency provision to be activated only if and when a state believes that it must exercise its sovereign right under Article X of the

NPT to withdraw from the treaty. Such action is possible on three months' notice. In these circumstances Canada would still have the assurance that its nuclear partner would continue to observe its commitment not to use heavy water, nuclear material, equipment, or technology subject to the agreement for any nuclear explosive purpose. With regard to nuclear weapons states (e.g. the U.S.A., the U.K. and France) which are nuclear partners of Canada, inclusion of this provision in agreements reflects a political commitment by those states not to use any Canadian material, nuclear material, equipment or technology subject to those agreements in their nuclear weapons programs.

ii) Fallback safeguards

If a state should decide to withdraw from the NPT, if that treaty should fall into disrepute, or if the IAEA is for some reason no longer able to apply safeguards to a state's nuclear activities, then Canada would wish to be in a position where it can satisfy itself that the Canadian-origin nuclear material, heavy water, equipment and technology that has been transferred to that state will continue to be subject to safeguards. The aim is to continue to verify observance by that state of its commitment to non-explosive use of Canadian-supplied or -derived nuclear items. Thus Canada requires continuity of safeguards coverage, or fallback safeguards.

iii) Retransfer control

Retransfer control provision serves an obvious purpose: there would be little use in Canada's having a non-proliferation and safeguards policy if a recipient country which satisfied the requirements of that policy were able to act as a middle-man and pass along Canadian-origin nuclear material, equipment or technology to third countries which did not.

iv) Reprocessing control

Canada seeks reprocessing control, not because it is opposed to reprocessing, but because it wants to be assured that any reprocessing of Canadian nuclear material would take place as an integral part of a significant nuclear energy program and that effective technical, institutional and safeguards measures have been put into place to ensure that there is no misuse of the separated plutonium. Canada has recently developed an approach whereby this control will be implemented on a long term, predictable basis. Many of our nuclear partners see this as important for their energy security in the future. Australia, another major uranium supplier, has adopted a similar approach. Canada also requires a control over high enrichment. Light water reactors require

natural uranium, which consists of two isotopes, U-238 (99.3 per cent) and U-235 (0.7 per cent), to be slightly enriched in the U-235 isotope to maintain a reaction. This enrichment is typically up to 2 per cent or 3 per cent. Very high enrichment of U-235 leads to weapons usable material. Internationally 20 per cent enrichment has been designated as a cut-off point and Canada exercises a prior consent right over enrichment beyond 20 per cent U-235. Since high enrichment for nuclear fuel cycle activities is relatively rare, the focus of attention has been on reprocessing and plutonium use.

v) Physical protection

Since all countries regard matters of physical security as falling strictly within their national jurisdiction, physical protection is a sensitive question. In implementing this requirement, Canada seeks from its nuclear partners a commitment that they will apply levels of physical protection to nuclear material which as a minimum would satisfy the recommendations of the IAEA as they are set out in document INFCIRC 225 (Rev 1).

VI Implementing Canada's non-proliferation policy

One-hundred-and-fifteen states are currently party to the NPT. All are theoretically eligible for nuclear co-operation with Canada. Many, however, are developing countries which do not have nuclear energy programs now and are unlikely to have them in the future.

Canada now has nuclear co-operation agreements reflecting all its policy requirements with:

| | |
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| Australia | - in force March 9, 1981 |
| Euratom | |
| (Belgium, Denmark, France, Federal Republic of Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, United Kingdom) | - in force January 16, 1978 |
| Finland | - in force August 15, 1976 |
| Japan | - in force September 2, 1980 |
| Korea, Republic of | - in force, January 26, 1976 |
| Phillipines | - signed June 19, 1981, but not yet in force |
| Romania | - in force June 14, 1978 |
| Sweden | - in force November 17, 1978 |
| United States | - in force July 9, 1980 |

New agreements are negotiated as they become necessary through the emergence of possibilities of nuclear co-operation with other countries. For example, at the time of preparation of this paper, texts of agreements had been discussed with Mexico, Egypt and Indonesia and these texts are ready for signature.

Canada also has bilateral agreements with Spain and Argentina under which "old" nuclear co-operation is taking place. Neither country is a NPT state, however, and thus "new" nuclear co-operation is precluded until such time as these states ratify the NPT or make an equivalent commitment to non-proliferation.

Brief notes on the history of some of Canada's nuclear co-operation agreements follow:

(a) The European Community and Japan

By early 1977, agreements incorporating the requirements of Canada's 1974 policy were negotiated with Argentina, the Republic of Korea, Spain, Finland, and Sweden. However, much difficulty was experienced in securing acceptance of these conditions by some other European countries and Japan, Canada's major uranium markets. The Canadian government decided, therefore, to suspend as of January 1, 1977, all nuclear exports to those countries until they accepted Canada's requirements. This step was a demonstration of Canada's commitment to non-proliferation and of its willingness to accept the commercial consequences of its non-proliferation policy. The year 1977 was taken up with intensive negotiations with the European Community (EC) and Japan. By January 1978 agreement had been reached with Japan on a renegotiated bilateral agreement, and uranium shipments were allowed to proceed. This agreement was ratified in September 1980.

The discussions with Euratom took a different course. All the elements of Canada's 1974 policy had been negotiated by late 1977 except for that of a prior consent right over reprocessing and high enrichment. An exchange of letters between Canada and the EC in January 1978 embodied the agreement that had been reached including an interim arrangement on the reprocessing issue. The International Nuclear Fuel Cycle Evaluation (INFCE), discussed below, was under way by then and it was recognized that a multilateral consensus on fuel cycles generally including the reprocessing question and its proliferation risks could be forthcoming. The EC and Canada agreed in the 1978 Interim Arrangement to return to the reprocessing issue once INFCE had been completed. Accordingly, new discussions on reprocessing were initiated in 1980. In December 1981, another exchange of letters took place that settled the reprocessing question. The formula that the two sides adopted comprised a description of the EC's current and planned nuclear energy program including in particular a detailed description of policy, legal and regulatory elements relevant to reprocessing and plutonium storage. On this basis, Canada agreed that nuclear material subject to the Canada-Euratom Agreement could be reprocessed and plutonium stored within the framework of the current and planned nuclear energy program as described and updated from time to time.

A similar long-term, predictable reprocessing arrangement has been arrived at with Sweden and similar arrangements are under discussion with other nuclear partners where the size and maturity of the nuclear program warrants it.

(b) India

After Canada suspended nuclear co-operation with India in 1974, it tried over the next two years to secure upgraded non-proliferation arrangements for Canadian-supplied nuclear items and facilities in India, but its efforts proved unsuccessful. As a result, Canada announced in May 1976 that it was terminating its nuclear relationship with India. The two RAPP reactors continue to be subject to IAEA safeguards. The CIRUS reactor continues to operate free of IAEA safeguards.

(c) Pakistan

Following the announcement in December 1974 of the more comprehensive non-proliferation policy, Canada entered into lengthy negotiations with Pakistan to conclude a bilateral agreement incorporating the requirements of that policy. By December 1976 it was evident that Pakistan was not prepared to meet Canada's requirements. In these circumstances, the Canadian government announced that for all practical purposes nuclear co-operation between Canada and Pakistan was at an end. The KANUPP reactor continues to be safeguarded by the IAEA.

(d) Argentina

After May 1974, Canada requested Argentina to provide a non-explosive use commitment with regard to any material, nuclear material, equipment, facilities and technology supplied by Canada. Argentina provided this commitment in September 1974 and, as required under the December 1973 contract, concluded a safeguards agreement with the IAEA in early December 1974. However, in December 1974 the Canadian government announced its more comprehensive non-proliferation policy. As acceptance of these new requirements by countries with which Canada was engaged in nuclear co-operation was made essential for all contracts, past and future, Argentina was required to negotiate a bilateral agreement with Canada covering the Embalse contract. Such an agreement was concluded in January 1976, and in turn made it necessary to negotiate a new IAEA-Argentina safeguards agreement, a task which was completed in July 1977. This agreement covers the Embalse reactor and would apply to any future nuclear co-operation between Canada and Argentina. In the midst of this process, Canada announced in December 1976 the requirement for NPT accession or equivalent and the application of fullscope safeguards. While Canada has demonstrated its willingness to co-operate further with Argentina in a broad range of nuclear matters, Argentina has to date not been prepared to make the necessary political commitment to non-proliferation or accept NPT-type fullscope safeguards. Canada continues to fulfil its obligations under the

December 1973 contract between Atomic Energy of Canada Ltd. and Comision Nacional de Energia Atomica but Argentina has been advised that no further nuclear co-operation can take place until Argentina fully meets Canada's non-proliferation policy requirements.

(e) Korea

In 1975, AECL concluded negotiations for the sale to the Republic of Korea of one CANDU reactor, including the technology necessary for its construction and operation. As required, a bilateral nuclear co-operation agreement incorporating non-proliferation requirements was concluded in January 1976. Korea acceded to the NPT in April 1975 and in November 1975 concluded a NPT-type safeguards agreement with the IAEA. Therefore Korea meets the requirements of Canada's policy. Construction of the Wolsung reactor is now nearing completion.

(f) Romania

Romania acceded to the NPT in 1970 and concluded a NPT-safeguards agreement with the IAEA in 1972. Moreover, in October 1977 Romania and Canada negotiated a bilateral nuclear co-operation agreement, which was ratified in June 1978. Romania, therefore, meets the requirements of Canada's policy. AECL and the Romanian state trading corporation, Romenergo, have signed contracts for two reactors.

VII The IAEA safeguards system

The IAEA is authorized under Articles III.A.5 and XII of its Statute to establish a system of safeguards to ensure that "assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose". Since its creation in 1957, the Agency, in co-operation with its member states, has worked steadily to improve the effectiveness of its safeguards operations established under those articles of its Statute. Canada supports this activity fully because Canada's bilateral agreements call for IAEA safeguards to be applied to Canadian-origin nuclear items transferred pursuant to these agreements.

While the Agency's Statute provides that it will apply safeguards to ensure as far as it can that no military objective will be fulfilled, the purpose of the application has been extended. The IAEA has stated that it interprets this undertaking as including the development, manufacture or testing of nuclear explosive devices of any kind.

The objective of IAEA safeguards is the timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection.

The basic approach of the IAEA to achieving this objective consists of the following main elements:

- a) The examination by the IAEA of information that is provided by the state. Such information includes accounting reports, special reports and advance notification of international transfers.
- b) The collection of information by the IAEA through inspections of various kinds. Information obtained through inspections is compared with that provided by the state to determine the latter's completeness, accuracy and validity.
- c) The monitoring of the flow of nuclear material in nuclear facilities through the use of various kinds of instruments and other techniques at certain strategic points. These are generally referred to as "surveillance and containment" measures. Equipment used for

this purpose includes cameras, closed circuit TV, seals.

- d) Independent verification by the Agency of the entire accounting for nuclear material subject to safeguards using chemical analysis and non-destructive measurements.

In general, the existence of a domestic accountancy and control system is a prerequisite to the application of efficient international safeguards, although of course a national accounting system by itself cannot replace the international safeguards applied by the IAEA.

In 1980, the IAEA employed some 150 inspectors who made about 500 visits to plants and scanned about six million photographs taken by sealed automatic cameras and affixed some three million seals.

As stated above, the objective of the Agency's safeguards operations is to detect diversion to any unknown use. If diversion conditions or non-compliance with a safeguards agreement is detected, the Director General of the IAEA informs the Agency's Board of Governors. The Board of Governors then calls upon the state concerned to remedy the non-compliance and may depending on the gravity of the situation also report to all members of the Agency and to the Security Council and General Assembly of the United Nations (Article XII.C of the IAEA Statute). The key point, however, is that it is the international response to the reported diversion or non-compliance that is considered to be the ultimate deterrent.

Canada has been a strong supporter of the safeguards operations of the IAEA, and Canadian technical experts have participated in advisory groups, technical committees and other gatherings convened by the Agency to improve those operations. Moreover, in support of the objective of IAEA safeguards, Canada established the "Canadian Safeguards Research and Development Program" in 1978 which is designed to assist the Agency in the development of safeguards systems for CANDU reactors. The program has received a five-year budget of approximately \$11 million and work under its auspices is already well-advanced.

VIII Current international situation

As previously mentioned, 115 countries have acceded to the NPT and the major nuclear suppliers have agreed to certain minimum guidelines governing their nuclear exports. Furthermore, significant resources have been made available to improve the operation of the IAEA's safeguards system. However, there continues to be a general acknowledgment that the current non-proliferation régime is not without its faults and weaknesses. Improvements are necessary and several recent international discussions have focused on this objective. These include:

1) The International Nuclear Fuel Cycle Evaluation (INFCE)

INFCE was an international technical evaluation carried out between October 1977 and February 1980. The evaluation, in which 46 countries and five international organizations participated and which resulted in eight Working Group Reports and a Summary and Overview Report totalling 1 600 pages, was not a political negotiation (no treaty or agreed upon arrangements could be formulated in INFCE) and its results or findings were merely to be transmitted to governments for their consideration. Three basic elements provided the focus for the study. The participants:

“were conscious of the urgent need to meet the world's energy requirements and that nuclear energy for peaceful purposes should be made widely available to that end;
were convinced that effective measures can and should be taken at the national level and through international agreements to minimize the danger of the proliferation of nuclear weapons without jeopardizing energy supplies or the development of nuclear energy for peaceful purposes;
recognized that special consideration should also be given to the specific needs of and conditions in developing countries”.

In the end, INFCE recognized the general principle that assurances of supply and assurances of non-proliferation are complementary and identified nine “fundamental matters the relevance, importance and acceptability of which should be considered” in common approaches to

establishing assurances of non-proliferation.

These were:

- a) undertakings on the peaceful uses of nuclear materials, equipment and technology and verification of these;
- b) undertakings not to develop or acquire nuclear weapons or nuclear explosive devices;
- c) undertakings not to acquire, manufacture or store nuclear weapons or to help any country to do so;
- d) undertakings with respect to the application of IAEA safeguards, including the requirements for nuclear materials accountancy and control and the implementation of any eventual IAEA system for storage of excess plutonium;
- e) adequate levels of physical protection;
- f) conditions governing the establishment and operation of certain stages of the nuclear fuel cycle and the management of their associated materials, including those stages based on international or multinational institutions or on national enterprises that fulfil a set of internationally or multilaterally agreed upon obligations;
- g) duration of non-proliferation undertakings and controls;
- h) sanctions and other measures to be applied in the case of a breach of non-proliferation arrangements;
- i) undertakings regarding transfer and retransfer of supplied materials, equipment and technology, and their multilabelling and safeguards contamination implications".

2) The second NPT review conference

This conference was convened in August 1980 to "review the operations of this treaty with a view to assuring that the purposes of the preamble and the provisions of the treaty are being realized". The conference failed to reach agreement on a final document. Debate on the "peaceful uses of nuclear energy non-proliferation and safeguards" articles of the treaty was highly emotional. The developing countries claimed that the national non-proliferation and safeguards policies of the nuclear suppliers went beyond the NPT, were being imposed unilaterally on them, and were preventing them from enjoying the benefits of the peaceful uses of nuclear energy. These allegations were countered by the major suppliers, and in the last days of the conference the participants were finally able to reach agreement on a text for inclusion in a final document of the conference. No final document was adopted, however, because of the dissatisfaction of the non-aligned countries over the lack of progress in arms control and nuclear disarmament.

3) Committee on Assurances of Supply

Following the conclusion of INFCE in February 1980, and in anticipation of the debate expected on non-proliferation/peaceful uses issues at the Second NPT Review Conference, the IAEA's Board of Governors adopted

in June 1980 a resolution establishing a Committee on Assurances of Supply to look into ways in which the supply of nuclear technology, materials and services could be improved consistent with a set of mutually acceptable non-proliferation considerations.

4) International plutonium storage

This represents an attempt to establish a scheme in which plutonium will be deposited in an international depository until it is required for nuclear energy production. The international discussions have shown that there are technical and political complexities that will need to be resolved before a viable scheme could emerge.

5) The UN Conference on Peaceful Uses of Nuclear Energy

In 1983, a UN Conference on the Peaceful Uses of Nuclear Energy will be convened. In these discussions attention may well focus on the "North-South" aspects of nuclear energy (e.g. technical assistance; training; codes of conduct; technology transfers; etc.) but the nature of the non-proliferation and safeguards framework within which international nuclear co-operation should take place will also be discussed. The latter discussions will probably continue to be difficult and a major effort will be needed to try to ensure that a more effective and comprehensive international non-proliferation régime will be the result or, at the minimum, that the elements of the current régime will not be weakened.

IX Conclusion

Canada's non-proliferation and safeguards policy has two objectives: 1) to promote the emergence of a more effective and comprehensive international non-proliferation régime; and 2) to assure the Canadian people and the international community that Canadian nuclear exports will not be used for any nuclear explosive purpose. By emphasizing the key role of the NPT, by promoting reliance upon and improvements in the IAEA safeguards system, by treating nuclear weapon and non-nuclear weapon states alike regarding Canadian nuclear exports, by working for new approaches covering the sensitive phases (e.g. reprocessing) of the nuclear fuel cycle, Canada's policy promotes attainment of the first objective. The latter objective is served through the network of bilateral nuclear agreements that Canada has put into place with its nuclear partners. Those agreements provide assurance that Canada's nuclear exports are used solely for legitimate, peaceful, nuclear energy production purposes.

At the same time, Canada, having formulated its non-proliferation and safeguards policy during the period 1945 to 1980, has recognized that it has gone as far as it can on its own in this field and that from this point on any further changes should be made on the basis of international agreement. The Canadian objective in post-INFCE forums such as the Committee on Assurances of Supply is to exert Canada's best efforts to persuade the international community to devise a more effective and comprehensive international non-proliferation régime into which Canada and other suppliers might subsume their national requirements.

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