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CANADA

XSNM-1339

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DEPARTMENT OF STATE

Washington, D.C. 20520

BUREAU OF OCEANS AND INTERNATIONAL
ENVIRONMENTAL AND SCIENTIFIC AFFAIRS

December 18, 1978

MEMORANDUM FOR JAMES R. SHEA
NUCLEAR REGULATORY COMMISSION

Enclosed is an Executive Branch analysis covering a license application for the export of highly-enriched uranium to Canada. In accordance with P.L. 95-242, the analysis explicitly addresses how the requirements of Section 126 a.(1) of the Atomic Energy Act are met, including the specific criteria of Sections 127 and 128, as well as certain additional factors, envisaged by Section 126 a.(1).

The Executive Branch, on the basis of its review of the application has concluded that the requirements of the Atomic Energy Act and P.L. 95-242 have been met and that the proposed export would not be inimical to the common defense and security of the United States. Moreover, Canada has adhered to the provisions of its Agreement for Cooperation with the United States. Therefore, the Executive Branch recommends issuance of the requested export license.

Louis V. Nosenzo
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Deputy Assistant Secretary

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Enclosure:
As stated.

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EXPORT LICENSE APPLICATION ANALYSIS

XSNM-1339

Country:	Canada
Transaction:	The export of 4.942 kilograms of U-235 contained in 5.297 kilograms of metallic uranium enriched to 93.3 percent to be fabricated into fuel elements by Companie pour L'Etude et la Realisation de Combustibles Atomiques (CERCA), France
Applicant:	Transnuclear, Inc.
Applicant's Reference:	Misc. 230 78-135/S
Date of Application:	June 29, 1978

Purpose of Exports

This highly-enriched uranium is to be shipped to France for fabrication into 24 MTR-type standard fuel assemblies fuel elements for the McMaster University Nuclear Research Reactor at Hamilton, Ontario, Canada.

McMaster is seeking delivery of at least 12 fuel assemblies before February 28, 1979 in order to restore the reactor from its current reduced duty cycle to its normal power level and operating schedule. Twenty-four assemblies are sufficient for about 2.5 years of normal reactor operation. Fuel fabrication lead time ranges from 6 to 12 months.

The McMaster Nuclear Reactor is a 5 megawatt MTR open pool facility for training, research and materials testing. It uses 34 standard fuel assemblies made up of curved-plate MTR-type fuel consisting of 93.3 percent enriched uranium alloyed with aluminum. On hand at present are 3.142 kilograms of unirradiated 92.9 percent enriched fuel; 6.699 kilograms of 93.15 percent material are now in core and there is no irradiated fuel in storage as 26 irradiated fuel assemblies were shipped to the Savannah River Plant (SRP) of USDOE on March 28, 1978 for reprocessing.

CANADA -- EXPORT LICENSE APPLICATION ANALYSIS

1. Applicable Agreement for Cooperation

The proposed export is subject to all of the terms and conditions of the Agreement for Cooperation between the Government of the United States of America and the Government of Canada concerning Civil Uses of Atomic Energy which entered into force on June 15, 1955, as subsequently amended. This fact has been confirmed by a letter from the Atomic Energy Control Board of Canada, a copy of which follows the description of the license application.

The provisions of this agreement are amplified by an exchange of notes between the two governments dated November 15, 1977, copies of which are enclosed.

Canada has adhered to all provisions of its agreement with the United States.

The intermediate transfer of uranium to France for the manufacture of fuel elements is subject to all of the terms and conditions of the Additional Agreement for Cooperation between the United States and the European Atomic Energy Community (EURATOM), as amended. This was confirmed in a letter from the Delegation of the Commission of the European Communities, a copy of which is enclosed.

The European Atomic Energy Community has adhered to all provisions of this agreement with the United States.

2. Extent to Which Export Criteria Are Met

A. Section 127 Criteria

As provided in Section 127 of the Atomic Energy Act, the following criteria govern exports for peaceful nuclear uses from the United States of source material, special nuclear material, production or utilization facilities, and any sensitive nuclear technology:

Criterion (1)

"IAEA safeguards as required by Article III(2) of the Treaty will be applied with respect to any such material or facilities proposed to be exported, to any such material or facilities previously exported and subject to the applicable Agreement for Cooperation, and to any special nuclear material used in or produced through the use thereof."

Canada is a Party to the Treaty on the Non-Proliferation of Nuclear Weapons and deposited its instrument of ratification on January 8, 1969. Canada's NPT safeguards agreement with the IAEA entered into force on February 21, 1972. Thus, IAEA safeguards are applied in Canada to all materials or facilities proposed to be exported, as well as to any such material or facilities previously exported pursuant to the U.S.-Canada agreement for cooperation and to any U.S.-supplied special nuclear material used in or produced through the use thereof. This understanding is confirmed in the exchange of notes between the Secretary of State for External Affairs of Canada and the Ambassador of the United States, signed on November 15, 1977.

Therefore, it is the Executive Branch view that criterion (1) is met with respect to Canada.

Since France is a nuclear-weapon-state (NWS), Article III(2) of the Treaty does not require the maintenance of IAEA safeguards in France. Therefore, it is the Executive Branch view that criterion (1) is met with respect to this export to France.

Nevertheless, the material proposed for export will be subject to safeguards while in France. Under Article V of the Additional Agreement for Cooperation of 1960, as amended, which incorporates Article XI, XII and Annex B of the November 8, 1958 Joint Program Agreement, as amended, the Community undertakes the responsibility of establishing and implementing a safeguards and control system designed to give maximum assurance that any material supplied by the

US or generated from such supply will be used solely for peaceful purposes ("EURATOM Safeguards System"). The Community is bound to consult and exchange experiences with the IAEA with the objective of establishing a system reasonably compatible with that of the latter. The Community is responsible for establishing and maintaining a mutually (with respect to the US) satisfactory and effective safeguards and controls system in accordance with stated principles.

EURATOM safeguards are being applied to material and facilities previously exported and subject to the US-EURATOM Cooperation Agreements and to special nuclear material used in or produced through the use thereof. These agreements require these safeguards to be applied to such material and facilities and to the proposed export and special nuclear material produced through its use.

Furthermore, some -- if not all -- U.S.-supplied source and special nuclear material and special nuclear material generated through the use thereof may be subject to the application of IAEA safeguards under GOV/1875, an agreement between France, EURATOM and the IAEA which was approved by the IAEA Board of Governors on February 13, 1978. This agreement has not yet entered into force, however. The agreement provides for the application of IAEA safeguards on source or special fissionable material to be designated by France in facilities or parts thereof within France. This concept is different from that of the U.S. and U.K. "Voluntary Offers," under which the IAEA is permitted to apply safeguards on all nuclear facilities, excluding only those facilities associated with activities with direct national security significance. However, a French official has indicated that, in principle, the French offer is no more limited than that of the U.K. and the U.S. but that, in practice, a higher proportion of material in France may be excluded because of its proportionately larger number of facilities which process materials for both military and civil use. It is, therefore, possible that IAEA safeguards ultimately may be applied to the proposed export by virtue of an appropriate designation by France when its agreement is implemented.

In view of the fact that source and special nuclear material may be transferred within the European Community without specific approval of the United States, it is also necessary to consider how criterion (1) is met with respect to the other member states of the Community.

Insofar as the other NWS, the U.K., is concerned, the considerations regarding criterion (1) are similar to those for France; Article III(2) of the Treaty does not require IAEA safeguards and the Executive Branch thus regards criterion (1) as met. It is noted, furthermore, that the agreement between the U.K. EURATOM and the IAEA implementing the U.K.'s "Voluntary Offer" entered into force in June 1978. It is possible, therefore, that IAEA safeguards may be applied pursuant to that agreement in connection with any subsequent retransfer to the U.K. of the proposed export.

The seven non-nuclear weapons state (NNWS) members of the European Community and the United Kingdom are parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Each of those seven states (Belgium, Denmark, the Federal Republic of Germany, Ireland, Italy, Luxembourg and The Netherlands) thus undertook the obligation in Article III(1) of the NPT to accept safeguards of the IAEA on all nuclear material in all of its peaceful nuclear activities and to enter into an agreement with IAEA to that effect.

As permitted by Article III(4) of the NPT, those seven states elected to join in concluding a single agreement with the IAEA (INFCIRC/193). Since they had already assigned to the European Atomic Energy Community (EURATOM) the responsibility and authority to apply safeguards within their territories (rather than each state establishing and maintaining a national system of accounting for the control of nuclear material), EURATOM is also a party to that agreement. The agreement, after approval by the Board of Governors of the IAEA and the European Community and ratification by each of the seven states, entered into force on February 21, 1977.

As in the case of all safeguards agreement between the IAEA and non-nuclear weapon states pursuant to Article III(1) of the NPT, the agreement with EURATOM and its seven non-nuclear-weapon member states (INFCIRC/193) includes provision for the completion by the parties of "Subsidiary Arrangements", setting forth in detail the manner in which the safeguards procedures called for in the agreement are to be carried out. In practice, the Subsidiary Arrangements consist of a general part and, for each of the facilities and locations in which IAEA safeguards are to be applied to nuclear material pursuant to the agreement, individual "Facility Attachments".

The agreement calls for the parties to make every effort to achieve the entry into force of the "Subsidiary Arrangements" within 90 days of the entry into force of the agreement proper. Extension of that period requires agreement among all the parties.

During the period since February 21, 1977, the parties have been negotiating the Subsidiary Arrangements, including Facility Attachments for the 205 facilities and locations which currently come within the purview of the agreement. The general part of the Subsidiary Arrangements has been completed and is in effect. As of September 15, 1978, approximately 145 of the Facility Attachments have entered into force and serve as the basis for IAEA safeguards activities at such facilities. About 15 others had been agreed at the negotiating level and the remainder were under active discussion. The parties have agreed to several extensions of the period for completion of the Subsidiary Arrangements, in accordance with the agreement. The latest such extension runs until February 20, 1979.

INFCIRC/193 provides, as does every safeguards agreement with the IAEA pursuant to Article III(1) of the NPT, the right to the IAEA to apply in all non-nuclear weapon states party to such an agreement, the procedures laid down in the agreement, including inspections, as soon as the agreement enters into force, even if the Subsidiary Arrangements are not in force. The agreements do not impose on the IAEA any limitations of access, or frequency, of these inspections prior to completion of Facility Attachments (see e.g.: Articles 71 and 76 of INFCIRC/193, increasingly exercised this right to apply procedures and inspections.

In summary, it is clear that each of the non-nuclear weapons state members of EURATOM is a party to the NPT, has fulfilled its obligation under Article III(1) of the NPT, and has an agreement in force with the IAEA in accordance with Article III(4) of that treaty under which the IAEA has clear rights, which are being exercised, to apply safeguards in all relevant facilities.

Therefore it is the Executive Branch view that criterion (1) is met with respect to all NNWS of the Community.

Criterion (2)

"No such material, facilities, or sensitive nuclear technology proposed to be exported or previously exported and subject to the applicable Agreement for Cooperation, and no special nuclear material produced through the use of such materials, facilities, or sensitive nuclear technology, will be used for any nuclear explosive device or for research on or development of any nuclear explosive device."

As a Party to the NPT, Canada is committed not to develop nuclear explosive devices for any purpose. Therefore, it is the view of the Executive Branch that criterion (2) is met.

With regard to the two nuclear-weapons states (NWS) of the Community, the UK and France, the proposed export and any special nuclear material produced through its use, if transferred to a NWS member, is subject to the continuing applicability of the US-EURATOM Agreements for Cooperation. Article XI(1) and (3) of the November 8, 1958 Joint Program Agreement, as amended, which is incorporated into the Additional Agreement for Cooperation by virtue of Article V of the Additional Agreement, provide that "no material, including equipment and devices, transferred pursuant to this Agreement" and "no source or special nuclear material utilized in, recovered from, or produced as a result of the use of material, equipment or devices transferred pursuant to this agreement... will be used for atomic weapons, or for research or development of atomic weapons or for any other military purpose." The US--with the support of most other major nuclear supplier states--consistently has taken the position that nuclear explosive devices are "atomic weapons", within the meaning of this guarantee, regardless of the intended end use of such devices. Both the UK and France, as members of the Nuclear Suppliers Group, have agreed as a matter of national policy to authorize the export of trigger list items "only upon formal governmental assurances from recipients explicitly excluding uses which would result in <u>any nuclear explosive device</u>" (underlining supplied) and have each notified the IAEA to this effect. This undertaking, together with other statements and actions, evidences the fact that both nations equate any nuclear explosive device, regardless of function, as essentially equivalent to an "atomic weapon".

Therefore, it is the Executive Branch view that the equivalent of criterion (2) is met with respect to NWS of the Community.

Criterion (3)

"Adequate physical security measures will be maintained with respect to such material or facilities proposed to be exported and to any special nuclear material used in or produced through the use thereof. Following the effective date of any regulations promulgated by the Commission pursuant to Section 304(d) of the Nuclear Non-Proliferation Act of 1978, physical security measures shall be deemed adequate if such measures provide a level of protection equivalent to that required by the applicable regulations."

In 1975, a team of U.S. Government experts visited Canada for an exchange of views on physical security including visits to facilities at which highly-enriched uranium is stored and utilized. The fixed site reviews included: (1) security forces, (2) physical barriers, (3) detection and alarm apparatus, (4) communication and response capabilities, (5) access and exit controls, (6) accountability and reporting procedures and equipment for protecting nuclear materials in transit were also examined.

The Team judged Canada's physical protection system, equipment and procedures, including transportation security arrangements, adequate to physically protect the type of material (i.e. highly-enriched uranium) requested in the license applications.

In the exchange of notes between the Secretary of State for External Affairs and the Ambassador of the United States, signed on November 15, 1977, Canada confirmed the understanding of the U.S. that both parties..."have committed themselves to ensure that adequate physical protection is applied to all such materials or equipment taking into account the measures set forth in INFCIRC/225 (Revised).

Moreover, on August 24, 1978 the Canadian Department of External Affairs provided the following assurance in the form of a note to U.S. Embassy Ottawa:

"The Department of External Affairs presents its compliments to the Embassy of the United States of America and has the honour to acknowledge receipt of its note no. 208 of July 31, 1978.

"The Department has noted that paragraph 3 of the Nuclear Supplier Group Guidelines, to which the Government of Canada and the United States subscribe, indicates that the implementation of physical protection in a recipient country is the responsibility of the Government of that country.

"In this regard, the Department confirms that physical security measures providing, as a minimum, a level of protection comparable to those set forth in both the Nuclear Supplier Guidelines and the International Atomic Energy Agency document INFCIRC/225/Rev 1, will be maintained with respect to nuclear materials and equipment exported to Canada from the United States and with respect to nuclear material used in or produced through the use of such material and equipment."

Therefore, it is the view of the Executive Branch that criterion (3) is met with respect to Canada.

It is the judgment of the Executive Branch that each member state of the Community has established physical security measures which, as a minimum, meet those recommended in the IAEA's INFCIRC/225/Rev.1, "The Physical Protection of Nuclear Material".

In addition, all states in the Community (except Denmark, Ireland and Luxembourg) also are members of the Nuclear Suppliers Group and, as such, have agreed to levels of protection consistent with INFCIRC/225/Rev. 1, to be ensured with respect to nuclear materials and equipment and facilities containing these materials, which are detailed in transmissions of the Nuclear Suppliers Guidelines to the IAEA.

During 1975, a team of U.S. Government experts visited France for an exchange of views on physical security with concerned government authorities and to visit certain major government and private industry facilities at which nuclear material is processed, stored and utilized, including the Cadarache Nuclear Research Center. The fixed site reviews included (1) security forces, (2) physical barriers, (3) detection and alarm apparatus, (4) communication and response capabilities, (5) access and exit controls, (6) accountability and reporting procedures, and (7) physical security organization. In the area of transportation, procedures and equipment for protecting nuclear materials while in transit were examined.

The U.S. teams judged the French physical protection system, procedures and equipment for transportation security adequate to physically protect the material subject to this license application.

The French Ministry of Foreign Affairs by note dated September 11, 1978 delivered to U.S. Embassy, Paris, provided the following assurances regarding the maintenance of physical security protection: "The French Government con-

firms that a level of physical protection at least equal to that defined in Annex B of the Nuclear Supplier Guidelines published by the IAEA under reference INFCIRC/254, will be assured for all nuclear material and installations imported from the United States as well as all nuclear material used or produced by use of such material and installations.

"The French Government can equally confirm that the same level of protection is assured for material and installations already imported from the United States."

The Executive Branch by letter to the Commission dated October 6, 1978 expressed the view that the above-cited French assurance meets the requirements set forth by the Commission under Part 110.43, pursuant to Section 304(d) of the Nuclear Non-Proliferation Act of 1978, in that the levels of protection called for in the Supplier Guidelines were derived directly from INFICRC/225/Revision 1 and were specifically designed to achieve levels of protection consistent with the physical protection measures in INFCIRC/225/Revision 1.

Therefore, it is the view of the Executive Branch that criterion (3) is met with respect to France.

Criterion (4)

"No such materials, facilities, or sensitive nuclear technology proposed to be exported, and no special nuclear material produced through the use of such material, will be retransferred to the jurisdiction of any other nation or group of nations unless the prior approval of the United States is obtained for such retransfer. In addition to other requirements of law, the United States may approve such retransfer only if the nation or group of nations designated to receive such retransfer agrees that it shall be subject to the conditions required by this section."

Article XI C. of the 1955 U.S.-Canada Agreement for Cooperation, as amended, stipulates that: "No material including equipment and devices, or any Restricted Data transferred to the Government of Canada or authorized persons under its jurisdiction pursuant to this Agreement will be transferred to unauthorized persons or beyond the jurisdiction of the Government of Canada except as the Commission may agree to such a transfer to another nation or group of nations, and then only if the transfer of the material or Restricted Data is within the scope of an Agreement for Cooperation between the United States of America and the other nation or group of nations."

In the exchange of notes between the Secretary of State for External Affairs and the Ambassador of the United States, signed on November 15, 1977, Canada confirmed the U.S. understanding that, "(1) Source materials, special nuclear materials, production facilities, utilization facilities, equipment and devices, and heavy water, hereafter transferred pursuant to the 1955 Cooperation Agreement, and all materials transferred pursuant to the Agreement embodied in the Exchange of Notes which entered into force on March 25, 1976, or as may otherwise be agreed and any special nuclear materials produced therefrom including subsequent generations derived from such special nuclear materials shall not be transferred beyond the jurisdiction of either party to the Agreement, unless the prior approval of the other party is obtained;"

These articles give the U.S. an unqualified approval right over the retransfer of material from Canada supplied

by the U.S. or produced through the use of such material and allow retransfers only if it is determined to be within the scope of an agreement for cooperation with the recipient country.

Therefore, it is the Executive Branch view that, as the U.S. has the right of prior approval over retransfer of U.S.-supplied material and material produced through the use of U.S. material, criterion (4) is met with respect to Canada.

Article XI(2) of the November 8, 1958 Joint Program Agreement, as amended, which is incorporated in the Additional Agreement for Cooperation, as amended, by Article V of the latter Agreement, provides that no material (including equipment and devices) may be transferred beyond the control of the EURATOM Community, unless the United States agrees.

Article 1 bis D of the Additional Agreement for Cooperation, as amended, provides that special nuclear material produced through the use of US-supplied material may be exported to any nation outside the Community or to a group of nations, provided that such nation or group of nations has an appropriate Agreement for Cooperation with the United States or guarantees the peaceful use of the produced material under safeguards acceptable to the Community and the United States. The European Community's interpretation of this language--as set out in an April 15 letter to the Department of State from Fernand Spaak, Head of the Delegation of the Commission of the European Communities--is that the European Community Supply Agency prior to any proposed transfer will consult with the United States to find out whether, in the view of the US, the proposed recipient of such produced special nuclear material has an Agreement for Cooperation with the United States which is "appropriate".

During discussions with representatives of the Community held in Washington on November 1, 1978, the European Community confirmed that material subject to Article 1 bis D could not be transferred outside of the Community unless the U.S. agreed that the recipient countries or group of nations had an appropriate Agreement for Cooperation with the U.S. or safeguards acceptable to both parties.

Therefore, it is the Executive Branch view that, with regard to the proposed export and special nuclear material produced through its use, criterion (4) is met. *

With respect to transfers within the Community, it should be noted that the use of the words "group of nations" in criterion (4) makes clear that no retransfer consent right is required within a group of nations under this criteria. With respect to this provision, the Senate report states:

> "It should be noted that under the US-EURATOM Agreements, the US does have a right of prior approval on retransfers of certain material outside of the EURATOM Community. It should also be noted that paragraph 4 does not require prior approval with respect to transfers within the EURATOM Community, consistent with US policy of treating that Community as a (single) entity."

The Congressional intent not to require US consent rights for transfers within the Community is also clear in Section 123 a.(5) of the Atomic Energy Act, as amended, since it requires that the US seek a guarantee "by the cooperating party" (which in this case is EURATOM as a whole).

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* It should be noted that since the US-EURATOM Agreements for Cooperation were authorized in accordance with Section 124 of the Atomic Energy Act, the Commission may continue to issue export licenses until March 10, 1980 pursuant to the authority in the first proviso in Section 126a(2), even if criterion (4) were not met.

Criterion (5)

"No such material proposed to be exported and no special nuclear material produced through the use of such material will be reprocessed, and no irradiated fuel elements containing such material removed from a reactor shall be altered in form or content, unless the prior approval of the United States is obtained for such reprocessing or alteration."

In the exchange of notes between the Secretary of State for External Affairs and the Ambassador of the United States, signed on November 15, 1977, Canada confirmed the understanding of the U.S. that, "(3) Source materials and special nuclear materials transferred hereafter pursuant to the 1955 Cooperation Agreement, and all materials transferred pursuant to the Agreement embodied in the Exchange of Notes which entered into force on March 25, 1976, or as may otherwise be agreed, and special nuclear materials produced through the use of such materials shall not be reprocessed, and irradiated fuel elements contained in the foregoing special nuclear materials removed from a reactor shall not be altered in form or in content by either party, unless the prior approval of the other party is obtained for such reprocessing or alteration."

As the November 15, 1977 exchange of notes clearly does not allow reprocessing or other alteration of U.S. origin material without the agreement of the United States, it is the view of the Executive Branch that criterion (5) is met with respect to Canada.

EURATOM is expressly exempted from Criterion (5) by virtue of Section 126(a)2 of the Act for a period of two years from March 10, 1978, since the Department of State notified the Nuclear Regulatory Commission on July 20, 1978, that EURATOM has agreed to negotiations with the United States as called for in Section 404(a) of the Nuclear Non-Proliferation Act of 1978. However, this exemption in no way derogates from the rights which the United States has under the US-EURATOM Agreements for Cooperation.

Criterion (6)

"No such sensitive nuclear technology shall be exported unless the foregoing conditions shall be applied to any nuclear material or equipment which is produced or constructed under the jurisdiction of the recipient nation or group of nations by or through the use of any such export sensitive nuclear technology."

The proposed export does not involve the transfer of sensitive nuclear technology. Criterion (6) is, therefore, not applicable.

B. Section 128 Criterion

Section 128 a.(1) of the Atomic Energy Act establishes the following additional criterion: "As a condition of continued United States export of source material, special nuclear material, production or utilization facilities, and any sensitive nuclear technology to non-nuclear-weapon states, no such export shall be made unless IAEA safeguards are maintained with respect to all peaceful nuclear activities in, under the jurisdiction of, or carried out under the control of such state at the time of the export."

As a Party to the NPT, Canada has accepted IAEA safeguards on all its nuclear activities thereby satisfying this criterion.

As France and the United Kingdom are nuclear weapons states, this criterion is not applicable to them.

As Parties to the NPT, all non-nuclear weapon states that are members of the European Atomic Energy Community have agreed to accept IAEA safeguards on all their nuclear activities.

Therefore it is the Executive Branch view that this criterion is met with respect to the non-nuclear weapon member states of the European Community.

3. Additional Factors

A. Safeguards Implementation

The IAEA Secretariat has noted in its Special Safeguards Implementation Report that with regard to nuclear material subject to IAEA safeguards, while some deficiencies exist in the system, no diversion of a significant quantity of nuclear material was detected in any of the 45 states in which inspections were carried out. Although recognizing the need to correct existing deficiencies in safeguards implementation, the Executive Branch has no reason to believe that the IAEA Secretariat's report is not valid. In the light of this and other factors associated with the proposed export, the Executive Branch believes the framework of commitments, assurances, and safeguards is adequate for the purpose of this export.

B. Special Non-Proliferation and Other Foreign Policy Considerations

In a report dated August 1, 1978 Argonne National Laboratory expressed the view that the McMaster Nuclear Reactor (MNR) is a candidate for use of reduced enrichment fuel when this fuel is available either commercially or through DOE subcontractors. The MNR currently utilizes U-Al alloy fuel containing 21 wt-% uranium enriched to 93.15% in U-235. The currently qualified maximum uranium content in fuels produced with powder metallurgy techniques is 42 wt-% U. With this maximum loading, the enrichment of the fuel used in the MNR can be reduced to about 45% with little detriment to reactor performance or fuel cycle costs, and no changes in the mechanical or hydraulic design of the reactor. Since the fuel currently being sought by MNR (UAl_x-Al with 21 w/o U, 93.3% enriched) is to be fabricated with powder metallurgy techniques, the change-over to fuel with 42 wt-% uranium loading and reduced enrichment (approx. 45%) might more easily be accomplished when this fuel has been demonstrated and is commercially available.

Enrichment reduction to less than 20% requires use of very high-uranium-density fuels currently under development. With 20% enriched uranium in powder metallurgy fuels (UAL_xAl or U3O8-Al), a loading of approximately 75 wt-% U is necessary to maintain core reactivity without redesign of the fuel assembly. Present long-term goals of the RERTR fuel development program are to increase the uranium loadings to 60 wt-% U in UAL_x-Al fuel and to 70 wt-% U in U3O8-Al fuel. Thus, design modifications to the MNR fuel assemblies and core thermal-hydraulics may be necessary to maintain performance levels and fuel cycle costs with 20% enriched uranium in powder metallurgy fuels. The optimal fuel element design for MNR operating conditions might be studied in a joint program between ANL and McMaster University. If development of ultra-high density (approx. 95 wt-% U) uranium fuels such as U3Si and U-10Mo is successful, enrichment reduction to less than 20% might be accomplished without redesign of MNR fuel assemblies or core thermal-hydraulics when this fuel has been demonstrated and is available commercially.

Argonne suggested that the U.S.G. might consider supplying MNR with HEU for the current and subsequent loadings until the high-uranium-density fuel with reduced enrichment has been demonstrated and is commercially available.

4. Inimicality Judgment

Based on review of the proposed export, it is the judgment of the Executive Branch that the proposed export will not be inimical to the common defense and security, and that the license should be issued.