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UNITED STATES AGREEMENTS FOR COOPERATION IN ATOMIC ENERGY

AN ANALYSIS

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UNITED STATES AGREEMENTS FOR COOPERATION IN ATOMIC ENERGY: AN ANALYSIS

A report prepared for
The Senate Committee on Government Operations

By
Warren H. Donnelly, Senior Specialist
and
Barbara L. Rather, Research Assistant
Environment and Natural Resources Policy Division

January 15, 1976

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January 15, 1976

Honorable Abraham Ribicoff
Chairman, Committee on Government Operations
United States Senate

Honorable John Glenn
Ad Hoc Chairman for Nuclear Affairs
Committee on Government Operations
United States Senate
Washington, D.C. 20510

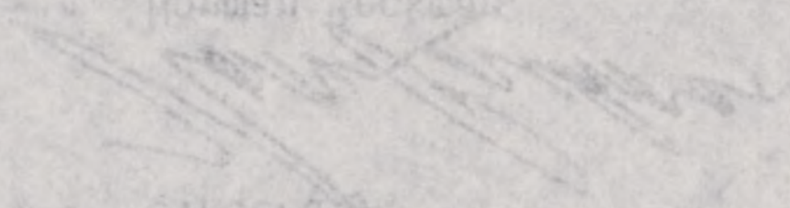
Dear Senators Ribicoff and Glenn:

I am submitting the enclosed report, "United States Agreement for Cooperation in Atomic Energy: An Analysis," which was prepared at your request for use in your hearings on S. 1439, The Export Reorganization Act of 1976. Its purpose is to provide background for your continued inquiry into Federal interagency organization and administration for nuclear exports and the relevance of these agreements to the export of nuclear products and technology and to proliferation of the ability to make nuclear weapons. The research and analysis was performed by Dr. Warren H. Donnelly, Senior Specialist, with the assistance of Ms. Barbara Rather, Reference Assistant. The authors are aware of the controversial and sensitive nature of the subject and have tried to state issues clearly based upon solid analysis.

We hope this report will be of assistance to the Committee.

Sincerely,

Norman Beckman
Acting Director, CRS



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I. SUMMARY OF OBSERVATIONS AND ISSUES

Summary of Factors Affecting Agreements for Cooperation

At the request of the Senate Committee on Government Operations, the authors examined U.S. agreements for nuclear cooperation in relation to (1) proliferation of the ability to make nuclear weapons, and (2) to legislation before the Committee to reorganize certain export functions of the Federal Government.* This examination has produced a commentary on factors that Congress may wish to keep in mind while considering the pending legislation and an identification of 14 related issues which appear to merit consideration.

The report identifies five overall factors relevant to negotiation and administration of the agreements for cooperation:

1. The agreements for cooperation and export licenses have fostered the substantial export of U.S. nuclear materials, equipment and technology since 1955 which have stimulated and strengthened the growth of nuclear energy industries abroad. This industrial growth probably would have occurred without U.S. nuclear cooperation, but at a slower pace. Nonetheless, the stronger and more diversified is the nuclear industrial base of a nation, the more readily it may, at its option, produce nuclear explosive materials and develop nuclear weapons.

2. The United States through the agreements for cooperation has obtained unprecedented modification of national sovereignty through

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* S. 1439, the Export Reorganization Act of 1976.

commitments of agreement nations to safeguard U.S.-supplied nuclear materials and equipment and to permit inspection by inspectors of the United States or the International Atomic Energy Agency. Provisions in the agreements which require application of international safeguards in agreement nations gave the International Agency practical working experience that was important preparation for its responsibilities under the Non Proliferation Treaty.

3. The formulation of the functions, negotiation and administration of agreements for cooperation and export licenses was dominated by the U.S. Atomic Energy Commission for the period 1955-1974 and the pattern it established has changed little since the Energy Reorganization Act was passed in 1974.

4. Times and circumstances have changed markedly since U.S. nuclear cooperation began in 1955. Concern about proliferation was then focused on the vertical proliferation of U.S. competition with the Soviet Union in production of nuclear weapons. Now concern has been extended to include horizontal proliferation of the ability to make nuclear weapons among many nations. In 1955 there was little thought of a chronic world shortage of oil and natural gas, although there should have been, so that use of nuclear power depended upon its economic competitiveness with cheap and plentiful fossil fuels. Now many nations are turning to nuclear power, rightly or wrongly, to relieve their dependence upon imported, high-priced oil from possibly unreliable suppliers. In 1955 one Federal agency, the U.S. Atomic Energy Commission, dominated U.S. nuclear cooperation with

its attendant agreements and export licenses. Today four Federal agencies are involved, three of which are under direction of the President and one of which is an independent regulatory agency substantially, but not wholly, independent of the President and his influence, raising possibilities for divergent or conflicting decisions and actions.

5. The implementation of the Energy Reorganization Act has helped draw attention to several matters meriting congressional attention in connection with the pending export reorganization legislation, and also with oversight of the administration of U.S. nuclear cooperation. The report identifies and discusses 14 specific issues and matters meriting such attention.

Matters of likely interest to Congress

During the examination of the agreements and writing of the commentary a number of matters became evident concerning negotiation and administration of the agreements for cooperation. There follows an identification of 14 such matters together with brief supporting discussion.

1. Organization for nuclear cooperation and negotiation of agreements for cooperation.

> Four Federal agencies participate in U.S. nuclear cooperation. Three of them answer to the President and one is an independent regulatory agency. This arrangement provides an independent check upon the executive branch actions, and could, therefore, lead to divergent or conflicting policies and decisions.

Four Federal agencies participate in various aspects of U.S. nuclear cooperation with other nations. The Department of State and the Energy Research and Development Administration negotiate the agreements for cooperation. The Administration administers them and authorizes certain

activities of U.S. nationals abroad. The Nuclear Regulatory Commission licenses the export of nuclear materials and equipment by the U.S. nuclear industry, and the Department of Commerce licenses exports of nuclear components not licensed by the Commission. The three departments and agencies report directly to the President while the Commission is an independent regulatory agency with substantial independence from Presidential direction, although the President has means to exert powerful indirect influence.*

The present organization opens possibilities for divergent or conflicting action between the executive branch agencies on the one hand and the independent Commission on the other. However, this independence provides a separate check upon nuclear exports under agreements for cooperation. To what extent the Commission needs to consider U.S. foreign policy and how consideration of this factor in addition to consideration of national defense and security are coordinated with the departments with primary responsibility for these functions are matters likely to merit congressional attention.

2. Administration of agreements

The administration of agreements for cooperation appears largely the responsibility of the Energy Research and Development Administration which may make decisions for re-export of U.S. transfers or other decisions that could differ from or conflict with similar decisions of the Nuclear Regulatory Commission. The nature and extent of interagency coordination in administration of agreements merits congressional attention.

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* The President designates the chairman, nominates Commissioners for appointment or reappointment, and controls the Commission's budget.

The Department of State has primary responsibility for negotiation of agreements for cooperation. However, the subsequent administration of those agreements appears to be primarily up to the Energy Research and Development Administration. The agreements in many provisions name the Administration to make subordinate decisions, arrangements and judgments. Assuming that the lead role of the State Department in negotiation of agreements stems from the importance of the agreements to foreign policy, then it seems reasonable to expect that the Department also should have a substantial, perhaps the principal role in administration. For example, the re-export of transferred materials and equipment is subject to approval by the Administration although some such transactions could have substantial foreign policy implications.

The arrival upon the scene of the independent Nuclear Regulatory Commission makes the interaction of the Commission with the Department of State and the Energy Research and Development Administratation a whole new field of public administration. To what extent are consistent judgment and action desirable in relation to the congressional desire for an independent check upon executive branch judgments and actions when nuclear materials or equipment are presented for export or re-export? Are informal contact and coordination, which now seem to be improving, sufficient or are statutory relations needed as insurance against a day when interagency relations may be strained or at odds?

Some examples. It seems likely that the Commission will take more of an interest in the physical security to be provided for U.S. exports

by agreement nations or international organizations. Yet administration of safeguards provisions of the agreements is the function of the Administration which thus also will be increasingly concerned with physical security. Consider also the export of enriched uranium. Many agreements limit the enrichment to 20 percent for U.S. exports unless the Administration decides otherwise. Yet at the time and place of export it will be the Commission that decides whether to issue a license for the supply of enriched uranium already agreed to by the Administration. These examples involve considerations of foreign policy as well as national defense and security. It is not clear how consideration of these factors by the Commission and the Administration should be coordinated, if at all.

It should be noted that one interpretation of the Energy Reorganization Act of 1974 underscores the importance of the Commission as an independent check and balance upon executive branch decisions for nuclear exports. In essence, the Commission is seen as possessing a potential veto over executive branch export actions, a veto that Congress expects the Agency to use if it cannot make the required findings for defense and security. Since there are no statutory provisions for appeal or reconsideration, presumably this veto power is absolute. Considering the substantial impact of this veto power, what provisions should there be, if any, for coordination between the Commission, the Administration and the State Department in instances of controversy? What consideration, if any, should the Commission be required to give to U.S. foreign policy and views of the executive

branch? Also, to what extent should Congress be able to make a final determination on a controversial export?

3. Revision of agreements

The agreements for cooperation contain no provisions for updating which may be a disadvantage for the future. However, agreements have been modified without such provisions, indicating they can be changed as needed.

Many agreements for cooperation have been changed or superseded since 1955 although they contain no provision for formal revision or updating. Nonetheless, some agreements contain out-of-date provisions such as references to then pending agreements with the International Atomic Energy Agency now long consumated, or to leasing of special nuclear materials. While the presence of out-of-date provisions probably does not impair the administration, they do become clutter. More important are prospects for future modification of the agreements to adapt them to changing times and conditions, particularly should the United States succeed in getting the nuclear exporting nations to agree upon common prerequisites for exports of sensitive nuclear technologies such as fuel reprocessing. It would seem desirable to have a right to reopen agreements as times change. Of course this implies a reciprocal right of an agreement nation to reopen an agreement and perhaps to seek to weaken present U.S. rights. So there are disadvantages as well as advantages to seeking provisions for routine updating. Nonetheless, the absence of such a provision is a matter of administration that Congress may wish to consider.

4. Future trends--the pending agreement with Egypt

Of particular interest to Congress are the pending agreements for cooperation with Egypt and Israel. The one for Egypt appears nearest to completion and information on its principal provisions has been issued by the State Department.*

On November 5, 1975, Secretary of State Kissinger and Egyptian Deputy Prime Minister Fahmy agreed in principle to conduct a program of cooperation in peaceful uses of atomic energy. Their agreement was viewed as an important step toward completing negotiations which, it is now hoped, can produce an agreement for cooperation in the near future.

From information released by the State Department, it appears that the agreement will closely follow typical agreements for research and power, with a few notable differences.

The scope of the agreement includes design, construction and operation of research and power reactors but does not mention fuel reprocessing or enriching which presumably are excluded.

The proposed commitment not to use any of the assistance for military purposes also specifically excludes the manufacture of any nuclear explosive device.

The plutonium produced in the powerplants covered under the agreement or derived from U.S. fuel supplied for these facilities will be reprocessed, fabricated and stored outside Egypt.

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* Department of State release no. 533, November 4, 1975.

Also, facilities utilizing relevant nuclear technology obtained from the United States will be under safeguards. There is, however, no commitment to place all nuclear materials and equipment in Egypt under international safeguards. The Egyptian Government also guarantees to apply "effective physical security measures" to the facilities and nuclear material covered by the agreement. How these measures might apply, if at all, to facilities and nuclear materials from other sources is not specified. Finally, the State Department release notes the intention of the United States that at such time as negotiations are completed, the same safeguards and special measures will be included in both the agreements for cooperation with Egypt and Israel respectively: "If certain provisions are modified or altered in one agreement, it is the intention of the United States Government to introduce such modifications or alterations in the other agreement."

5. Re-export control

> While initial exports of nuclear materials and equipment are licensed by the Nuclear Regulatory Commission, the agreements for cooperation require approval of the Energy Research and Development Administration for re-export of such items by an agreement nation. This anomaly could lead to confusion or divergent actions and therefore merits congressional attention.

The organization and administration of agreements for cooperation and the licensing of nuclear exports present an anomaly concerning export and re-export of nuclear materials and equipment. If an item such as a quantity of enriched uranium, is to be exported directly from the U.S. nuclear industry to an agreement nation, a license must be obtained from the Nuclear Regulatory Commission. However, if the agreement nation later

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wishes to re-export that item to another nation, it must obtain the approval of the Energy Research and Development Administration, even though a similar direct export to the second nation would require an export license from the Commission. In situations where one nation can turn to another or to the United States for a desired nuclear item, there is the possibility of inconsistent or even contradictory decisions and actions by the Commission and the Administration. This anomaly merits congressional attention.

Another facet of re-export is that of nuclear technology. U.S. agreements for cooperation provide for control over re-export of material things but not for re-export of nuclear technology supplied by the United States.

6. Safeguarding nuclear technology

> The agreements for cooperation require international safeguards for nuclear materials produced from exported nuclear materials or equipment, but not for nuclear materials produced in facilities built only with the help of U.S. technology and "know how". This appears to be a loophole which other governments are beginning to close in their agreements for nuclear cooperation. The safeguarding of U.S.-furnished nuclear technology is a matter warranting congressional attention.

The agreements for cooperation provide for safeguards for U.S.-supplied nuclear materials and equipment, and for nuclear material produced from them. The agreements do not, however, commit the agreement nation to declare nuclear facilities made with U.S. information and technology or by persons trained in the United States and to apply safeguards to them. In recent innovative actions, the governments of France and West Germany have sought to close this loophole in agreements for nuclear cooperation with South Korea and Brazil, respectively.

The general adoption of this innovation would help to assure nations throughout the world that their neighbors are not using imported technology to build unsafeguarded nuclear facilities. Of course, the effectiveness of such a provision depends ultimately upon the motivations of the agreement state and the factors that sustain its compliance with the terms of an agreement. Assuming, however, that agreements will be honored, it seems likely that this innovation is desirable and that the United States should seek to add it to existing as well as to future agreements.

7. Reprocessing of spent fuels

The agreements for cooperation provide assurances that reprocessing of U.S. supplied nuclear materials will be done only in facilities acceptable to the United States. Since there is little reprocessing of commercial nuclear fuel, these commitments remain untried. The demand for fuel reprocessing is likely to increase, however, and with it the desire of agreement nations to reprocess, particularly if there are no regional reprocessing centers or access to reprocessing in the United States. What changes can be made in terms and administration of agreements for cooperation to minimize the metastasis of fuel reprocessing among individual nations is a likely matter for congressional interest.

The agreements for cooperation generally provide that all alteration and reprocessing of nuclear fuel from the United States shall be done in facilities acceptable to both parties upon a joint determination that safeguards may be efficiently applied. The power agreement with the United Kingdom is silent on this matter. The power agreement with India specifies that India may reprocess any special nuclear material used in the Tarapur Atomic Power Station upon a joint determination that safeguards may be effectively applied, or in such other facilities as may be mutually agreed. Of special interest in India is that its reprocessing facilities can reprocess

its own materials, which are not under the agreement. This can complicate the workings of materials accountability and safeguards systems. It is somewhat akin to the problem of a butcher shop in keeping higher and lower grades of meat separate in the meat grinder: it requires unusual measures and discipline.

In the early years of the agreements, the used fuels from research reactors were returned to the United States for reprocessing, which was feasible because these fuels were comparatively simple in chemical and metallurgical qualities. At present there is little commercial reprocessing of nuclear power fuels. Used fuels are mostly stored until reprocessing becomes available, or a decision is made not to reprocess but to store used fuels indefinitely. So there is no commercial competition on the world market for fuel reprocessing and the attendant risks that some reprocessors might pay less attention to safeguards than others. However, several nations are trying to acquire their own fuel reprocessing capability, including Brazil, Iran and South Korea. A trend toward national fuel reprocessing would compete with and perhaps weaken the efforts to establish regional fuel reprocessing facilities under international safeguards.

In the administration of agreements for cooperation, the United States can expect future pressure from agreement nations concerning reprocessing. If the United States does not permit those nations to reprocess U.S.-supplied fuel in their own plants, it will have to offer alternatives. But these are few. At present no commercial fuel reprocessing plants are operating in the United States to perform this service. Reprocessing of nuclear power

fuel in the facilities of the Energy Research and Development Administration would interfere with production of plutonium for weapons and would require extensive modification of process equipment. The concept of regional plants, while supported by interested parties, has yet to attract enough concrete support to begin their construction. For a while the agreement nations probably could store used fuels in their own facilities. Sooner or later, however, their storage capacity will be filled up. Used fuel could be collected and stored at regional centers awaiting reprocessing, but this concept too requires much more international commitment than is now on the horizon. Used fuels could be returned to the United States for indefinite storage or temporary storage pending reprocessing. This alternative, however, would require construction of storage facilities, for the present ones would be inadequate.

The world situation for reprocessing of nuclear fuels is likely to undergo fundamental changes within the coming decade. What these changes may be and how the agreements for cooperation can be modified in terms and administration to anticipate and to influence these changes appear to be likely matters for congressional interest.

8. International safeguards for all nuclear activities in an agreement nation

> The agreements for cooperation with non-weapons nations do not require international safeguards on all nuclear materials and facilities of an agreement nation, whether or not supplied by the United States. U.S. attempts to have nuclear supplier nations agree upon prerequisites for exports have yet to succeed. What can be done to obtain such commitments collectively with other supplier nations, or unilaterally, and what the benefits and disadvantages might be, are matters for congressional attention.

The agreements for cooperation commit agreement nations to place U.S.-supplied nuclear materials and equipment under international safeguards but do not require the nations to place all of their nuclear materials and equipment from whatever source under these safeguards. According to recent press reports, the United States has been trying with little success to convince nuclear supplier nations to require such a commitment as a prerequisite for their nuclear exports. Whether the United States should unilaterally attempt to require an expanded safeguards commitment as a condition for U.S. nuclear cooperation is a controversial question. Such a position might serve only to deny the U.S. nuclear industry access to the world market, with the advantage then going to the nuclear industries of other exporting nations. What measures the United States might take to convince other nuclear supplier nations of the desirability of the U.S. position is a matter worth congressional attention.

9. Physical security

> The agreements for cooperation do not reflect the current importance attached to physical security and protection of U.S. nuclear exports against theft or sabotage. The relationships among the State Department, the Energy Research and Development Administration and the Nuclear Regulatory Commission should be considered if the Commission is directed by statute to consider physical security in issuing export licenses.

The increase in terrorist acts over recent years has caused some observers to warn that terrorists might try to steal nuclear explosive materials and to make and use nuclear weapons. This concern has generated increasing attention in the United States to physical protection and security for nuclear materials and facilities. The greatest risks for terrorist theft

would appear to be at fuel reprocessing and fuel fabrication plants and for materials in transit. These risks of terrorist, or other subnational, theft will increase if plutonium and highly enriched uranium become widely used as nuclear fuels, particularly if and when breeder reactors come into general use. At present responsibility for protection of nuclear materials and equipment is that of the nations involved. There is no international nuclear security agency.

U.S. agreements for cooperation do not commit agreement nations to meet U.S. standards for physical security. Although the agreements place U.S. supplied materials and equipment under international safeguards, these do not extend to physical security. The furthest that the International Atomic Energy Agency has gone is to issue a security guide. If the Nuclear Regulatory Commission is required to decide whether physical security in an agreement nation is adequate to permit licensing of a proposed nuclear export, then some consideration is indicated of the relationships between the State Department, the Energy Research and Development Administration and the Commission in considering physical security in the negotiation and administration of agreements for cooperation and in the licensing of nuclear exports.

10. Preference for NPT adherents

Although encouraging nations to ratify the Non Proliferation Treaty is a goal of U.S. foreign policy, the agreements for cooperation do not include preferential terms for nations that have ratified the treaty. Whether such preferences should be provided, and in what forms, is an open question for the 1970s.

The Non Proliferation Treaty has been in effect for five years. During this time, none of the agreements for cooperation have been amended to give any preference to those agreement nations which ratify the treaty, or at least to agree to place all of their nuclear activities under international safeguards. Whether such preferences would affect the hard core of industrial nations opposed to the treaty is debatable, regardless of whether other, less determined nations might be influenced to ratify. Whether it would be feasible to offer some preferential treatment for agreement states that ratify the NPT and whether such preferences would be worth their cost and possible disadvantages are questions meriting congressional attention.

11. Government-to-government transfers

> Although most nuclear exports are now made via export licenses issued by the Nuclear Regulatory Commission to private parties, the Energy Research and Development Administration still may make government-to-government transfers. Two issues arise from this situation. First, to what extent could the executive branch use such transfers to circumvent export controls by the Commission? Second, what voice, if any, should the Commission have in the negotiation and administration of government-to-government transfers?

In the early years of nuclear cooperation, the U.S. Atomic Energy Commission often transferred materials directly to agreement nations without export licenses. Such licensing was limited to exports by fledgling companies in the U.S. nuclear industry. In later years, direct government to government exports decreased as the USAEC withdrew from competition with the growing U.S. nuclear industry.

Now most nuclear exports are made via export licenses of the Nuclear Regulatory Commission issued to companies in the industry or to persons

who act as agents in the United States for foreign customers. However, government to government transfers remain possible and under the Energy Reorganization Act still require no license.

Although there is little serious anticipation that the Nuclear Regulatory Commission would be continually at loggerheads with the State Department or the Energy Research and Development Administration over nuclear cooperation and exports, it appears that the executive branch could try to circumvent an obstinate Commission by reviving government to government transfers. If this loophole is real, then Congress may wish to consider the future use of government to government exports, limitations upon their use, and the relationships of the State Department, the Administration and the Commission in their arrangement.

Concerning information in the public record, the Commission's practices for domestic licenses would suggest full information in the dockets for export licenses. On the other hand, details of foreign policy matters usually are not open to the public. The extent to which the Commission's decisions on export licenses should be documented in the public docket is a question likely to be raised by public interest groups concerned about U.S. nuclear exports.

12. NRC findings on defense and security

The Nuclear Regulatory Commission has to make findings involving the common defense and security, based largely upon information and analysis provided by the executive branch. Of likely congressional interest is the ability of the Commission to develop resources capable of arriving at sound findings, and the extent of documentation of these findings in the public record.

Before it can issue an export license, the Nuclear Regulatory Commission must find that the export is not inimical to the common defense and security. Since the Commission is primarily an independent regulatory agency concerned with certain economic and safety and environmental effects of civil nuclear power, it has comparatively little experience with consideration of national defense and security.

The Atomic Energy Act of 1954 as amended contains no guidance or detailed definition of this criteria and the Commission's resources to consider these factors are small in comparison with those of the Federal departments having primary responsibility for defense and security. The Commission receives advisory analyses from the Department of State after that Department has obtained comments and inputs from other departments and agencies. It serves as the funnel for a homogenized statement of advice from the executive branch. Also, the dockets of the Commission's license actions contain little information of the Commission's analyses.

Of potential interest to Congress are two matters. First, the Commission's ability to independently arrive at sound findings concerning the relation of a particular export to national defense and security. Second, in the light of recent moves to open up the processes of government to the public, it may be time to consider what information should appear in the Commission's dockets for export licenses.

13. Peaceful nuclear explosives

Although the U.S. opposition to non-weapons states' developing nuclear explosives of any kind is well known, except for three

cases the agreements for cooperation are silent on the use of U.S.-supplied materials and equipment for this purpose. How important are guarantees not to use U.S. exports for this purpose, and what can be done to obtain the guarantees, are matters of current interest.

The agreements for cooperation are silent about use of U.S.-supplied materials and equipment to develop so-called peaceful nuclear explosives. Only four agreements, those with Israel, Portugal, Spain and South Africa, note the U.S. opposition to such use. Although all agreement nations are committed to use transferred items solely for civil purposes and not to use them for atomic weapons or for military purposes, there is no prohibition on peaceful nuclear explosives. The definition of atomic weapons in the agreements does not include such devices,* and civil uses are not defined. Considering that United States opposition to the development of such devices by non-weapons nations is well known, it seems unlikely that an agreement state would resort to a legalistic reading of the present terms to justify its misuse of U.S. supplied materials and equipment. Nonetheless, it could happen. Considering that the echoes of the Indian Government's detonation of a peaceful nuclear explosive are still being heard in discussions of safeguards and proliferation, it seems likely that Congress will be interested in the administration of agreements for cooperation to prevent such use of U.S.-supplied materials and equipment.

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* An atomic weapon is defined in U.S. agreements for cooperation to mean any device utilizing atomic energy the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapons test device. There is no reference to explosive devices.

14. Public participation

The public has no opportunity to participate in the negotiation or administration of agreements for cooperation and limited opportunities for participation in the licensing decisions of the Nuclear Regulatory Commission. Whether and to what extent such participation is desirable, its advantages and disadvantages, and the nature of information to be made available to the public are controversial questions. Nonetheless, it may be desirable to consider them in the light of recent trends toward openness in government.

The negotiation and administration of agreements for cooperation provide for no public participation nor would they usually be expected to for subjects of less importance than proliferation of nuclear weapons. Details of foreign relations historically have been kept confidential without public participation. Now the procedures of the Nuclear Regulatory Commission provide for some public participation for decisions on nuclear exports and the possibility of a hearing before an Atomic Safety and Licensing Board. So far these provisions have been little exercised.

As for documentation for the public, the records of agreements for cooperation are not public documents whereas certain documents appear in the Commission's dockets for export licenses. These dockets, however, contain little detailed information or analysis used by the Commission.

Whether there should be expanded opportunity for public participation in arrangements for nuclear cooperation with other nations is a controversial question. It is complicated by the organizational situation in which two Federal agencies with little history of public participation have the responsibility for negotiation and administration of agreements and an independent regulatory agency with a history of openness acts on export licenses.

Nonetheless, with the present trends toward participatory democracy and openness in government, the matter of public participation may merit attention.*

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* One difficulty encountered in making this study was obtaining complete and authentic texts of many of the agreements for cooperation. Often a final version had to be assembled by cutting and pasting changes from various documents. So there is some uncertainty that all of thes reconstructions are wholly accurate. Since the agreement documents are comparatively short, it would appear both feasible and desirable to republish complete, authentic texts for revised agreements, and to reissue a complete text whenever an agreement is modified in the future.

II. PURPOSE, APPROACH AND INFORMATION SOURCES

The Senate Committee on Government Operations requested the Congressional Research Service to prepare a background report on U.S. agreements for cooperation in atomic energy, more commonly known as bi-lateral agreements. The purpose of the report is to provide background information for hearings on S. 1439, The Export Reorganization Act of 1976, which proposes to revise Federal organization and control for U.S. nuclear exports.

The report describes the origins of the present web of U.S. bilateral agreements, identifies and discusses features relevant to limiting the further proliferation of nuclear weapons among nations of the world, describes similarities and differences of several kinds of bilateral agreements, and concludes with a statement of observations and issues for further congressional attention.

The report is based upon the examination of 32 agreements for cooperation with foreign nations and international organizations plus a review of information previously presented to Congress and to the public on the negotiation, administration and use of these agreements. The approach is comparative, seeking to point out salient features, similarities and differences, and to indicate the significance of some of these features to the organization and management of nuclear exports under new organizational relationships established by the Energy Reorganization Act of 1974.

Sources of information include the texts of the agreements, and hearings before the Senate Committee on Government Operations, the House Committee on Interior and Insular Affairs, and the House Committee on International

Relations. While the authors have had a few contacts with the Energy Research and Development Administration and with the Department of State, these contacts have been deliberately minimized in preference to use of the public record and information generally available to the public, particularly the texts of the agreements. Any consequent gaps in this analysis with respect to the changing role of agreements for cooperation, their uses, their limitations, and their relevance to the troublesome issue of proliferation of nuclear weapons among the nations of the world can be corrected by the agencies concerned in their appearances before the Committee.

III. BILATERAL AGREEMENTS: WHAT ARE THEY AND WHY?

The fundamental mechanism for international nuclear cooperation between the United States and other nations or international organizations is an Agreement for Cooperation. These agreements are popularly known as "bilateral agreements." A variation which involves commitments by the United States and the other party to the International Atomic Energy Agency is known as a trilateral or tripartite agreement. Agreements for cooperation are negotiated for the United States by the Department of State with the strong participation of the Energy Research and Development Administration. To take effect, they require a Presidential finding and approval, and must lie before Congress for a specified time during which Congress in essence can exercise a veto. The agreements provide the framework for technical cooperation and for export of U.S. nuclear materials, powerplants and related equipment to nations abroad, and for safeguarding of exported items against theft, diversion or illicit use.

Transfer of Information: a Prime Mover for World Use of Nuclear Power

The worldwide spread of the science and technologies of atomic energy and nuclear power was extended greatly beginning in the 1950s by an outward surge in information from the United States.*

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* The two terms, atomic energy and nuclear power, are frequently used. They are not synonyms. Atomic energy is the more inclusive term which encompasses uses of radiation and radioactive materials as well as production of useful energy from fission and fusion. Nuclear power is limited to the technologies for producing useful energy (process heat or electricity) from fission of uranium atoms.

The transfer of scientific and technical information has been a driving force for development of atomic energy ever since O.R. Frisch and L. Meitner early in 1939 speculated that absorption of a neutron by a uranium nucleus sometimes caused fission. The role of information exchange became immediately evident. News of this speculation was brought to the United States in January 1939 by Niels Bohr who at once communicated this idea to his former student, J.A. Wheeler and others at Princeton. From them the news spread by word of mouth to neighboring physicists, including E. Fermi at Columbia University. By January 26, 1939, the fission process was discussed at a conference on theoretical physics in Washington, D.C. Before this meeting was over, experiments had confirmed that neutrons could initiate fission and other confirmations were reported in the February 15, 1939, issue of Physical Review. From then on there was a steady flow of papers on fission. The scientific community itself soon attempted to stop publication of further data by voluntary agreement because of military implications but was not able to do so for about a year.* The voluntary control of 1940 was soon supplanted by government controls and restrictions as the wartime atom bomb project began to move. Information on military

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* Professor Smyth in his famous report noted that in the spring of 1939 a small group of foreign-born physicists in the United States attempted to stop publication of further data on fission by voluntary agreement. Leading American and British physicists agreed, but F. Joliot, France's foremost nuclear physicist, refused, apparently because of the publication of one letter in the Physical Review sent in before all Americans had been brought into agreement. Consequently, publication continued freely for about another year although a few papers were withheld voluntarily by their authors. Cf., H.D. Smythe. Atomic energy for military purposes. Princeton; Princeton University Press, 1945, p. 45.

and civil uses of nuclear energy was held secret, and Congress in the Atomic Energy Act of 1946 continued this secrecy and the premise that certain information was born classified and subject to strict control. In the Atomic Energy Act of 1946, Congress in an extraordinary grant of peacetime authority gave the U.S. Atomic Energy Commission control over the dissemination of "restricted data" in such a manner as to "assure the common defense and security."* "Restricted data" was defined to include information relating to civil use of nuclear power.** In the Act, Congress limited international exchange of information on industrial nuclear power, but encouraged the dissemination of scientific and technical information relating to uses other than weapons and industrial power.

The policies of the United States for exchange of information and technology for atomic energy is characterized by two distinct phases. From 1946 to 1954 the national policy sought to confine and prevent the export of U.S. nuclear information and technology. From 1954 to the present national policy has emphasized the benefits of such transfers and has promoted them.

The era of restricted transfer: 1946-1954

After the rejection in the United Nations of the U.S. proposals for international control and development of atomic energy (the Acheson-Lilien-

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* Section 10(a) of the Atomic Energy Act of 1946.

** The 1946 Act defined "restricted data" to mean "...all data concerning the manufacture or utilization of atomic weapons, the production of fissionable material, or the use of fissionable material in the production of power, but shall not include any data which the Commission from time to time determines may be published without adversely affecting the common defense and security.

thal report and the Baruch Plan), the United States sought to bar the export of U.S. technology for nuclear weapons and power. Beginning with the Atomic Energy Act in 1946, there followed almost a decade of secrecy and severe limitations upon exports and international cooperation.

While the Atomic Energy Act of 1946 did contemplate sharing of information concerning the practical industrial applications of atomic energy with other countries, this was prohibited until "effective and enforceable safeguards against its use for destructive purposes [could] be devised." This statutory condition never was fulfilled and the restrictions of the Act ended the wartime nuclear collaboration of the United States, the United Kingdom, Canada and Belgium. The only cooperation permissible in 1946 was for exploration for uranium ores and their procurement. Five years later Congress slightly relaxed the restrictions by authorizing the Atomic Energy Commission to exchange certain information with other countries about the "refining, purification and subsequent treatment of source materials, reactor development, production of fissionable material, and research and development."* In this amendment Congress laid down four limitations for U.S. technical assistance in nuclear energy limitations that have become the foundation for negotiation and approval of agreements for cooperation. These limitations were:

(1) a prohibition against communication of weapons design and fabrication data;

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* Public Law 82-235, 65 Stat. 692, 1951.

(2) a requirement for adequate security standards in countries receiving classified information;

(3) a determination by the President that the arrangements would promote and would not endanger the common defense and security; and

(4) a requirement that the Joint Committee on Atomic Energy be informed of the arrangement 30 days prior to its consummation.

The era of open exchanges: 1954 to the present

By 1954 the impetus of the Atoms for Peace Program of President Eisenhower and the failure of U.S. restrictions on international nuclear cooperation to prevent the spread of nuclear weapons abroad combined with technological optimism for the future of nuclear power to reverse U.S. policy on exchange of nuclear information and cooperation.

International cooperation in nuclear energy.--When Congress rewrote the Atomic Energy Act in 1954, it greatly expanded the prospects for international cooperation in civil nuclear energy.* The Act includes major provisions in section 54 for the United States to distribute special nuclear materials. Under the Energy Reorganization Act of 1974, this distribution function was assigned to the Energy Research and Development Agency.** Section 54 limits such distribution to nations or groups of nations with an agreement for cooperation with the United States. Also, with one exception, the Energy Research and Development Administration is to be compensated

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* The Atomic Energy Act of 1954, P.L. 83-703, 68 Stat. 919.

** The Energy Reorganization Act of 1974, P.L. 93-438, 88 Stat. 1233.

for special nuclear materials distributed at not less than ERDA published charges. Also, ERDA is authorized to enter into contracts to provide for the producing or enriching of special nuclear materials in its facilities for exports to nations or organizations with an agreement for cooperation.*

Section 54 authorizes the Energy Research and Development Administration to distribute to the International Atomic Energy Agency, or to any group of nations, only such amounts of special nuclear materials and for such periods of time as are authorized by Congress.

Section 54 also provides for repurchase of special nuclear materials distributed under a sale, and to purchase special nuclear materials produced through use of special nuclear materials which were sold or leased.

U.S. agreements for cooperation in atomic energy. --When Congress rewrote the Atomic Energy Act in 1954, it greatly expanded the prospects for international cooperation in civil nuclear energy, but within specific statutory restriction. Section 123 of the Act provides approaches to international cooperation by forbidding cooperation with any nation or regional defense organization until four conditions are fulfilled. These four conditions are:

(1) ERDA has submitted to the President the proposed agreement for cooperation, together with its recommendations thereon;

(2) The President has approved and authorized the execution of the proposed agreement and has made a determination in writing that "the performance of the proposed agreement will promote and

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* The Atomic Energy Act of 1954, Section 161(v)(B).

will not constitute an unreasonable risk to the common defense and security;"

(3) The proposed agreement, together with the approval and determination of the President, has been submitted to the Joint Committee and has lain before the Committee for thirty days; and

(4) Certain agreements, together with the President's approval and determination have lain before the Joint Committee for sixty days during which Congress by concurrent resolution may state it does not favor the proposed agreement. For these agreements, the Joint Committee on Atomic Energy is required to report its views and recommendations to Congress during the first 30 days and to supply a draft concurrent resolution stating in substance that the Congress favors or does not favor the agreement.*

As for terms and conditions of the agreements, Congress specified in Section 123 that each agreement must include:

(1) The terms, conditions, duration, nature, and scope of the cooperation;

(2) A guaranty by the cooperating party that security safeguards and standards agreed upon will be maintained; and

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* The agreements which are to receive this special attention are those involving a nuclear reactor that may be capable of producing more than five thermal megawatts or special nuclear materials for use in connection therewith. Also included are agreements arranged under subsection 91(c) of the Act (dealing with military applications), and under subsections 144(b) and (c) (dealing with international cooperation for weapons.)

(3) A guaranty by the cooperating party that any material and any restricted data to be transferred will not be transferred to unauthorized persons or beyond the jurisdiction of the cooperating party except as specified in the agreement.*

Negotiation of agreements for cooperation.--The Department of State and the Energy Research and Development Administration are the two agencies primarily responsible for drafting and negotiating agreements for cooperation.

An Executive order in 1959 by President Eisenhower specified that the negotiating functions are to be performed by or under the authority of the Secretary of State and further specified that international cooperation under the Act shall be subject to the responsibility of the Secretary of State with respect to the foreign policy of the United States pertinent thereto.** It appears that since then the U.S. Atomic Energy Commission and now the Energy Research and Development Administration have had the major responsibility of drafting and negotiating the agreements, finally submitting them to the Department of State for review.

U.S. control of nuclear exports.--The agreements for cooperation provide a framework for commercial exports of nuclear materials, equipment and technology to agreement nations. However, many of the commercial transactions are subject to government controls. The Nuclear Regulatory

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* Restricted data is a term with special meaning under the Atomic Energy Act of 1954. It is defined as "all data concerning (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy,

**Executive Order 10841. September 30, 1959

Commission licenses the commercial export of source and special nuclear materials to agreement nations and also the nuclear part of nuclear power plants and fabricated nuclear fuel. The Energy Research and Development Administration, by regulating activities of U.S. nationals abroad, controls one important avenue for the export of nuclear technology and know-how. The Department of Commerce licenses the export of parts to nuclear power plants which are not controlled by the Commission. In addition, the Administration can directly export nuclear items through government-to-government transfers that require no NRC license.

The export control authority of the Energy Research and Development Administration is of particular interest as one approach to controlling the export of technology. Section 57(b) of the Atomic Energy Act of 1954 as amended makes it unlawful for any person to directly or indirectly engage in the production of any special nuclear material outisde of the United States except (1) under an agreement for cooperation, or (2) upon authorization by the Commission (now ERDA) after a determination that such activity will not be inimical to the interest of the United States. This function went to the Administration in the Energy Reorganization Act of 1974. Using this authority, the Administration's regulations now require authorization for the following activities by U.S. nationals: *

> (i) Designing or assisting in the design of facilities for the chemical processing of irradiated special nuclear material, facilities for the production of heavy water, facilities for the separation

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* Unclassified activities in foreign atomic energy programs, 10 CFR 810. Federal Register, vol. 40, Sept. 30, 1975: 44826-44828.

of isotopes of uranium, or equipment or components especially designed for any of the foregoing; or

(ii) Constructing, fabricating, or operating such facilities; or

(iii) Furnishing information not available to the public in published form for use in the design, construction, fabrication, or operation of such facilities or equipment or components especially designed therefore.

The regulations appear to require, for example, authorization for a U.S. engineering firm to design a fuel reprocessing plant for a foreign country, or to send its engineers abroad to help in such design. By so controlling the activities of experts and companies in the nuclear industry, the Administration controls some export of technology. Note that if a company proposes to export a fuel reprocessing plant, it has to get a Commission license. How these respective authorities will interact in the future is not clear. For example, could ERDA insist that it must authorize the design part of an export while the Commission licenses the physical part? Which agency would control follow-on technical assistance and servicing associated with a major export of U.S. nuclear equipment?

Differing criteria for decisions. --Under the Atomic Energy Act of 1954 as amended, the President, the Nuclear Regulatory Commission and the Energy Research and Development Administration all make decisions of one kind or another concerning nuclear cooperation and exports, some of which involve statutory criteria for decision. Table I identifies eight such decisions and the associated statutory criteria. Criteria for five decisions require consideration of national defense and security, two require consideration of risk to the public health and safety, and one consideration

TABLE I.
CRITERIA FOR DECISIONS
AFFECTING NUCLEAR EXPORTS

CRITERIA	NUCLEAR REGULATORY COMMISSION					PRESIDENT	ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION		
	NRC Blanket licensing for small quantities of special nuclear materials	NRC Export of source or special nuclear materials.	NRC Export of byproduct materials	NRC Export of production and utilization facilities	President Determination of agreements	ERDA Distribution of certain plutonium	ERDA Declassification of Restricted Data	ERDA Authorization to engage in production of SNM abroad.
Not inimical to the common defense and security or health and safety of the public.		X						
Not inimical to common defense and security.			X			X		
Will not constitute an unreasonable risk to the common defense and security.				X				
Will promote and will not constitute an unreasonable risk to the common defense and security.					X			
Without undue risk to the common defense and security.							X	
Will not be inimical to the interests of the United States.								X
Will not constitute an unreasonable risk to the health and safety of the public.	X							

of the interests of the United States. The Act defines the term "common defense and security" to mean the common defense and security of the United States.* "Health and safety" is not defined, nor are "interests of the United States." In any event, the President has to determine whether a proposed agreement for cooperation will "promote and will not constitute an unreasonable risk to the common defense and security" while the Nuclear Regulatory Commission has to consider whether certain licenses would be "inimical to the common defense and security" and in some cases to the "public health and safety." The Energy Research and Development Administration has to consider whether declassification of restricted data would constitute "undue risk to the common defense and security", and whether authorizing certain activities by "persons" abroad would be "inimical to the interests of the United States".

The variety of these statutory criteria and their use by different parts of the Government suggests the possibility that strict adherence to the criteria can produce decisions on a common matter that could be inconsistent or at cross purposes.

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* The Atomic Energy Act of 1954 as amended, section 11(g).

IV. PROVISIONS OF SPECIAL RELEVANCE TO PROLIFERATION

The provisions of the agreements for cooperation relevant to proliferation of the ability to make nuclear weapons are identified and discussed in this chapter. An examination of several types of agreements follows in Chapter V.

Some provisions of agreements for cooperation relate to proliferation of the ability to make nuclear weapons through their effect upon the use of nuclear power and the nuclear industrial base of agreement nations. Other provisions relate to proliferation through their effect upon the prevention and detection of theft or diversion of nuclear materials, or the misuse of equipment transferred from the United States. This chapter identifies and briefly discusses the major provisions of each category that appear in agreements for cooperation.

Exchange of information

The agreements for cooperation establish the basis for virtually unrestricted exchange of scientific information about nuclear energy between the United States and agreement nations, and for Restricted Data that has been declassified. The opening up of exchange of information caused by the Atomic Energy Act of 1954 was dramatic. Before then, information on the first U.S. nuclear powerplant at Shippingport was kept almost as secret as information on the powerplants for the atomic submarine. By 1955 declassification had progressed far enough for the U.S. Atomic Energy Commission to fully describe Shippingport in Geneva at the first United Nations International

Conference on Peaceful Uses of Atomic Energy. However, some restrictions remain.

The agreements for cooperation specify that Restricted Data is not to be communicated, and that no materials, or equipment and devices are to be transferred and no services furnished if that transfer or furnishing involves the communication of Restricted Data. Since the Energy Research and Development Administration decides what information can be declassified, in a sense it controls the information which can be transferred.

As for information which may be exchanged, the agreements commit the Parties to exchange unclassified information (note, the term Restricted Data is not used) with respect to the application of atomic energy to peaceful uses and the considerations of health and safety connected therewith. The agreements specify that the exchange will be accomplished through various means including reports, conferences, and visits to facilities. The subjects of such exchange may include information on:

(1) Development, design, construction, operation and use of research, materials testing, experimental, demonstration power and power reactors, and reactor experiments;

(2) The use of radioactive isotopes and source material, special nuclear material, and byproduct material in physical and biological research, medicine, agriculture and industry; and

(3) Health and safety considerations related to the foregoing.

It is notable that the agreements do not apply several anti-proliferation provisions to information transferred by the United States to other

nations. These anti-proliferation provisions include (1) the safeguards rights of the United States; (2) the guarantees not to use transferred materials, including equipment and devices, for weapons or for military purposes; (3) the commitments to use materials, equipment or devices transferred solely for civil purposes; and (4) the application of international safeguards.

Access to special facilities

The agreements for research and development and for research commit the Parties to make available for mutual use specialized research facilities and reactor materials testing facilities, if terms and conditions can be agreed upon at the time and if space, facilities and personnel "conveniently available" permit.

At the outset these provisions were unilateral, for with the exception of Canada, the agreement nations had few if any facilities of interest to the United States. The flow of scientists and engineers from other lands to U.S. nuclear facilities has helped these nations to acquire a cadre of personnel with practical training and working experience in nuclear science, technology and power.

There are now some prospects of reciprocal value to the United States as the nuclear programs of major supplier nations diversify and move in directions not of primary interest to the U.S. nuclear program. For example, in the third decade of the nuclear age, specialized facilities in West Germany could become of interest to the United States.

Cooperation between persons

The agreements for cooperation in addition to providing for cooperation between governments and their agencies also opened the way to cooperation between "persons" of the United States and an agreement nation.* The agreements typically state the understanding of the Parties that arrangements may be made between either Party or authorized persons under its jurisdiction for the transfer of equipment and devices and materials. Arrangements may also be made for the transfer of special nuclear material and for the performance of services with respect thereto for uses specified in the agreement.

In essence, these provisions permit companies in the U.S. nuclear industry to deal directly with the governments, and with the nuclear and electricity industries of the agreement nations for export of nuclear products and for performance of nuclear services such as fuel reprocessing. Note, however, that performance of enrichment services by U.S. firms is still moot, at least until privately owned enrichment facilities are licensed and built in the United States.

Transfer of materials and equipment

The research and power, and research agreements provide for the transfer of source material, heavy water, byproduct material, other

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* Note, however, that the definition of "person" in the Atomic Energy Act of 1954 is broad. The term means (1) any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, governmental agency other than the Commission, any State or any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent or agency of the foregoing.

radioisotopes, stable isotopes and special nuclear material for purposes other than fueling reactors and reactor experiments. The transfers may be made for defined applications and in such quantities and under such terms and conditions as may be agreed upon when such items are not commercially available. The provisions also extend to transfer of equipment and devices under such terms and conditions as may be agreed.

Supply of special nuclear materials

The agreements for cooperation contain elaborate provisions for the United States to supply enriched uranium and other special nuclear materials to agreement nations. Depending upon the agreement, the materials may be supplied by government-to-government transfer, by lease or sale of the materials, or by supplying enrichment services to the agreement nation or persons under its jurisdiction. The export shipment of the enriched uranium, once it leaves the Government's enrichment plant usually is arranged by an agent who must obtain an export license.

The research agreements are the simplest, for the amounts of special nuclear materials transferred are small, usually only enough to operate a research reactor or a reactor experiment. Here the United States commitment is simply to transfer the desired materials, with terms and conditions for contracts to be agreed upon in advance.

The research and power agreements are more complicated. They provide for contracts with the Energy Research and Development Administration for the production of enriched uranium from U.S. ores, or for enrichment of normal uranium supplied by the agreement Nation. The agreements

assure the agreement nation that it will have access on an equitable basis with other purchasers of such services to uranium enrichment capacity available in the Administration's facilities and not already allocated. Here too the assurance is becoming academic for the U.S. enrichment plants have been booked to capacity since mid 1974; so no further long-term enrichment or production contracts can be signed.

The agreements set general limits upon the amount of special nuclear materials to be transferred. Sometimes a numerical limit is used. For example, a research agreement may limit the net amount of uranium-235 contained in enriched uranium which may be transferred.* Typically, there is further restriction that the quantity of enriched uranium transferred for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity necessary for the loading of such reactors or experiments plus an additional quantity as, in the opinion of the Administration, is necessary to permit the efficient and continuous operation of such reactors or experiments.

As for the power only agreemments, that with India commits the Energy Research and Development Administration to sell to the Government of India as needed all requirements of India for enriched uranium for use as fuel at the Tarapur Atomic Power Station, with the further understanding

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* Note, the limits on transfers are not quantities of enriched materials, but rather quantities of the uranium-235 isotope contained within the enriched materials. So the weight of enriched uranium exportable would vary inversely with the enrichment: the less the enrichment, the more enriched uranium could be transferred.

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that Tarapur is to be operated on no special nuclear material other than that provided by the United States or produced therefrom. The Indian agreement sets a ceiling of 14,500 kilograms of U-235 contained in enriched uranium sold. The net amount is defined to be the gross quantity of U-235 contained in the enriched uranium sold to India less the amount of recoverable uranium resold or otherwise returned to the United States or transferred to any other nation or group of nations or international organization with the approval of the United States. The quantity of enriched uranium sold by the Administration and held by the Government of India is not at any time to be in excess of the quantity necessary for the full loading of the Tarapur Atomic Power Station, plus such additional quantity as, in the opinion of the Parties, is necessary to permit efficient and continuous operation of the Station.

The agreement with the United Kingdom sets out a ceiling of 8,000 kilograms for the net quantity of U-235 contained in enriched uranium transferred, and specifies a detailed formula for computation of net amount. In this agreement the Administration states its readiness to sell enriched uranium to the United Kingdom for fueling reactors of its civil power program, including merchant marine propulsion.* The Administration is also committed to enter into contracts for producing or enriching uranium for the United Kingdom, to such extent and subject to such terms and conditions as may be established by the Administration.

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* Note, however, the British did not develop merchant marine applications of nuclear power and are making little use of power reactors fueled with enriched uranium.

While enriched uranium gets most of the attention in agreements for cooperation, other special nuclear materials can be provided. The research and power agreements with Argentina and Brazil specifically mention for the transfer of plutonium to both nations for use in reactor and reactor experiments under terms and conditions to be agreed. The agreement with Greece permitted transfer of plutonium provided that the quantity within Greek jurisdiction not exceed 250 grams of plutonium in the form of fabricated foils and sources and 10 grams in other forms. The power agreements with India and the United Kingdom are silent about U.S. supply of plutonium.

Reprocessing of irradiated special nuclear materials

A provision of special relevance to proliferation is that dealing with the reprocessing of used nuclear fuels to recover plutonium or U-233 and residual uranium. It is at the reprocessing plant that recovered plutonium or U-233 are in a form most usable for the making of nuclear weapons and most susceptible to deversion or theft.

The research and power, and research agreements require that reprocessing shall be performed in facilities acceptable to both Parties upon a joint determination that the safeguards requirements of the agreement may be effectively applied. The agreements go a step further and require that any alteration of irradiated fuel elements removed from a reactor be performed in mutually acceptable facilities. Under this commitment, the agreement nations can only remove and store spent fuel pending the required joint determination. It is not clear, however, whether the joint determination is

a one-time affair made once during the term of an agreement or whether it applies each time fuel reprocessing is required.

The power agreement with India provides that reprocessing may be performed in Indian facilities upon a joint determination of the Parties that safeguards may be effectively applied, or in such other facilities as may be mutually agreed. It is understood that except as may otherwise be agreed, the form and content of any irradiated fuel elements removed from the reactors are not to be altered before delivery to the reprocessing facility. The agreement with the United Kingdom is silent on reprocessing.

As for who owns plutonium produced in irradiated fuel supplied by the United States, if the agreement nation bought the original fuel material from the United States, the agreement nation has title. Also, if the special nuclear material is leased from the Energy Research and Development Administration, the lessee has title unless the Administration and the agreement nations otherwise agree.

The Indian agreement gives the United States a first option to purchase such nuclear material at the fuel value price of the Administration which may be in effect at the time. If the Administration does not exercise this option, India, with the approval of the United States, may transfer such excess special nuclear material to any nation or group of nations or international organizations. This agreement includes no limitation upon the nations to which special nuclear materials from reprocessed fuel can be transferred. In comparison, the research and power agreements require that

the receiving nation have an agreement for cooperation with the United States, and the research agreements require Administration approval.

Guarantees

Two guarantees included in agreements for cooperation apply to use of transferred items for atomic weapons or military purposes and transfer of items to unauthorized persons or beyond the jurisdiction of the agreement nation. Concerning use for nuclear weapons, the agreements typically provide that:

> No material, including equipment and devices, transferred to the government of...or authorized persons under its jurisdiction by purchase or otherwise pursuant to this Agreement or the superseded Agreements, and no special nuclear material produced through the use of such material, equipment and devices, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose.
>
> (Note: There is no specific prohibition of use of U.S. transfers to make nuclear explosives.)

The commitment concerning transfers is designed to assure the United States that items it supplies, or that are exported by the U.S. nuclear industry, will not be transferred without the agreement of the Energy Research and Development Administration to unauthorized persons or outside the jurisdiction of the agreement nations. Typically, the agreements provide that:

> No material, including equipment and devices, transferred to the Government of ... or to authorized persons under its jurisdiction pursuant to this agreement or the superseded agreements will be transferred to unauthorized persons or beyond the jurisdiction of the Government of...except as the Commission [Administration] may agree to such a transfer to the jurisdiction of another nation or group of nations, and then only if, in the opinion of the Commission [Administration], the transfer is within the scope of an agreement for cooperation between the Government of the United States and the other nation or group of nations.

The power agreement with India contains a commitment not to use transferred material, equipment or devices for atomic weapons or for research on or development of atomic weapons or for any other military purpose. The word "material" is not defined but would seem to include special nuclear materials. In this agreement the United States likewise guarantees that no special nuclear material produced at the Tarapur Atomic Power Station and acquired by it, or an equivalent amount of the same type substituted therefor, shall be used for atomic weapons or for research on or development of atomic weapons, or for any other military purpose. It is not clear why the Indian commitment mentions only "materials" while the U.S. commitment specifies special nuclear materials.

The power agreement with the United Kingdom contains the atomic weapon commitment by both Parties and specifically extends to special nuclear material produced through the use of any transferred materials. As for transfers, the provisions are similar but somewhat changed in that neither Party is to transfer materials to any unauthorized person or beyond its jurisdiction without the written consent of the supplying party.

A commitment to civil use

In addition to commitments by agreement nations not to use transferred materials, equipment and devices for nuclear weaponry or military purposes, the agreements typically include an expression of common interest that any material, equipment or devices made available to the agreement nation or any person under its jurisdictionn shall be used solely for civil purposes. Whether civil purposes premit "peaceful nuclear explosives" is

not usually not specified. The power agreement with India limits this commitment to items made available to the Government of India for use in the Tarapur Atomic Power Station, or in connection therewith. The Indian agreement indicates a difference of opinion between the Parties in the following observation included in the text:

> ...The Government of India emphasizes, in contrast to the position of the United States, that its agreement to the provisions of this Article in relation to equipment or devices transferred pursuant to this Agreement has been accorded in consideration of the fact that, as provided in this Agreement, the Tarapur Atomic Power Station will be operated on no other special nuclear material than that furnished by the Government of the United States of America and special nuclear material produced therefrom, in consequence of which the provisions of this Article in relation to equipment or devices in any case ensue from the safeguard on fuel.

The meaning of this qualification is not clear. The power agreement with the United Kingdom contains no commitment to civil use.

U.S. safeguards rights

The agreements for cooperation broke new ground in the guarantees and rights obtained for the United States concerning the safeguarding of nuclear materials, including an unusual right to send its inspectors into the sovereign territory of the agreement nation.

The agreements for cooperation in research and power, and for research onl, all contain commitments relating to review of the design and operation of facilities and to safeguarding of source and special nuclear materials. Typically, an agreement commits the agreement nation to permit the United States to review the design of any reactor and any other equipment and devices the design of which the Energy Research and Development Administration determines to be relevant to the effective application of safeguards,

with the objective of assuring design and operation are for civil purposes and permit effective application of safeguards.

The United States also has unusual rights for source and special nuclear material made available to the agreement nation or individual to any person under its jurisdiction, and any source of special nuclear material "...utilized in, recovered from, or produced as a result of the use of ..." specified materials, equipment or devices. These rights are: to require records and reports, to require that materials be subject to all safeguards provided in the agreement, to require deposit of materials in storage facilities designated by the Administration, and to designate inspectors after consultation with the agreement government.

The agreements typically specify the rights of the United States as follows:

> To designate, after consultation with the Government of..., personnel who, accompanied, if either Party so requests, by personnel designated by the Government of ..., shall have access in...to all places and data necessary to account for the source material and special nuclear material which are subject to...this Article to determine whether there is compliance with this Agreement and to make such independent measurements as may be deemed necessary.

In case of noncompliance with these safeguards provisions, or the commitment for application of safeguards of the International Atomic Energy Agency, the United States has the right to suspend or terminate the agreement and to require the return of any materials, equipment and devices under the agreement.

The power agreement with India has similar provisions, with enough differences to be worth noting here. Concerning design review rights, the

agreement notes the Parties had reviewed the design of the Tarapur Atomic Power Station and made a review of any significant modification in design for the sole purpose of "...determining that the arrangements provided in this Article can be effectively applied." For the same purpose, the Parties may review the design of other facilities which will use, fabricate, or process any special nuclear material made available under the agreement or produced in the Station. The agreement contains an interesting exemption to the design review for India. The Indian agreement specifies that:

> ...Such a review of the design of these other facilities will not be required if the Government of India, pursuant to mutually acceptable measurement arrangements, has placed an agreed equivalent amount of the same type of special nuclear material under the scope of this Agreement.

It is not clear what this substitution provision accomplishes. The Indian agreement provides for a system of records and reports to be established to assure the complete accountability of any special nuclear material which is made available to that Government pursuant to the agreement, or which is produced in the Tarapur Atomic Power Station. Any special nuclear material provided under the agreement or produced in the Tarapur Atomic Power Station which is surplus to the current needs of the fuel cycle for the Station and which is not transferred by the Government of India shall, unless otherwise mutually agreed, be stored at the Tarapur Atomic Power Station.

Concerning inspections, the Indian agreement provides for consultations and periodic exchanges of visits to give assurance that the objectives of limiting Tarapur to peaceful purposes and the provisions concerning transfers

are being observed. To the extent relevant to the accomplishment thereof, personnel designated by the Government of the United States, following consultations with the Government of India, have full access to the Station and to conversion, fabrication and chemical processing facilities in India at such time as special nuclear material transferred to the Govenment of India for, or received from, the Station is located at such facilities, and at such other times as may be relevant. Personnel so designated are to be afforded access to other places, and data, and to persons, to the extent relevant. The personnel designated by either Party, accompanied by personnel of the other Party, if the latter so request, may make such independent measurements as either Party considers necessary. Nothing in the Agreement is intended to impede the ability of either Party to have prompt access to data, places and persons to the extent relevant to the objective of civil use. The United States commits itself to keep such access to a minimum consistent with the need for effective verification that the objectives are being observed.

Another interesting provision unique to the Indian power agreement deals with substitution of nuclear materials. The agreement provides that:

> Notwithstanding anything contained in this Agreement, the Government of India shall have the right, upon prior notice to the Government of the United States, to remove from the scope of this Agreement quantities of special nuclear material, provided it has, pursuant to mutually acceptable measurement arrangements, placed agreed equivalent quantities of the same type of special nuclear material under the scope of this Agreement.

Concerning noncompliance, the Indian agreement gives the United States the right to suspend or terminate the agreement, within a reasonable time,

and require the return of any equipment and devices transferred under it and any special nuclear material safeguarded pursuant to the agreement.

The power agreement with the United Kingdom, a nuclear weapons country, has no specification of U.S. rights.

The Atomic Energy Commission exercised these rights of inspection until the safeguards functions were transferred to the International Atomic Energy Agency through tripartite agreements. As late as 1969, AEC inspectors made 52 inspections of facilities in five countries. The end of the era of AEC inspections was signalled in 1963 when the AEC, Japan and the International Atomic Energy Agency entered into the first tripartite agreement.

IAEA safeguards

One early purpose of the U.S. agreements for cooperation was to provide the International Atomic Energy Agency with working experience in the application of safeguards. This was done by including in the agreements a commitment by the agreement nations to apply the Agency's safeguards to materials, equipment and facilities transferred from the United States. The international safeguards are carried out either under a trilateral agreement among the Parties and the Agency, or as provided in an agreement between the agreement nation and the Agency pursuant to the Non Proliferation Treaty. During the time the international safeguards apply, the safeguards rights of the United States are suspended to the extent that the United States agrees that the need to exercise such rights is satisfied by the international safeguards. Should the international safeguards be terminated, the United

States reassumes its full safeguards rights. At that time the Parties are to examine the situation so that appropriate measures can be taken, if necessary, to satisfy any obligations of the United States under the Treaty.

The agreement for cooperation for power with the United Kingdom provides for termination of international safeguards by either Party. In that case, the United Kingdom upon request will return all special nuclear material received and still under its jurisdiction. The United States, in turn, is to compensate the United Kingdom for its interest in returned materials at the schedule of prices then in effect.

The power agreement with India likewise provided for application of international safeguards to such special nuclear material produced in the Tarapur Atomic Power Station as may be received in the United States, or to equivalent material substituted therefor. The agreement provided for termination of the agreement for cooperation if there was not mutually satisfactory agreement on the terms of the contemplated trilateral agreement. If such termination was invoked, India would return all special nuclear materials under the agreement and the United States would compensate India for such material at current prices. Each Party further agreed not to invoke its termination rights before carefully considering the economic effects of such termination. Neither was to terminate until the other party had been given sufficient advance notice to permit arrangements by the Government of India for an alternative source of power and to permit adjustment of production schedules for nuclear materials by the United States. It appears that these termination rights and conditions applied only at the time the

trilateral agreement was pending. The agreement is silent on what would happen if the trilateral agreement which is in effect were to be terminated in the future.

V. PRINCIPLE FEATURES OF AGREEMENTS FOR COOPERATION

The agreements for cooperation, as noted earlier, provide a framework for cooperation in civil use of nuclear energy between the United States and other countries and international organizations. This framework initially supported a great unilateral outflow of nuclear science and technology from the United States in the late 1950s and now supports a web of commercial nuclear transactions and exports of the U.S. nuclear industry in the world market.

The agreements are notable in that although not treaties, they deal with matters of substantial international importance, particularly with respect to the further spread of national manufacture of nuclear weapons. They contain unusual assurances of the agreement nations, assurances intended to bar the possibility that nuclear materials and facilities supplied by the United States will be used to make nuclear weapons or for other military purposes. Additionally, they are unique in the rights obtained for the United States or the International Atomic Energy Agency to send inspectors into the agreement nations to verify compliance with the agreements.

Types of agreements

The U.S. agreements for cooperation with individual countries can be conveniently divided into three categories. Twenty agreements are for cooperation in nuclear research and power, eight for nuclear research only, and two for power only. The United States also has three agreements for cooperation with international organizations: one with the International

Table II. List of Agreement Nations and their NPT Status

Country	Effective Date	Termination	Ratified NPT
	Research and Power Agreements		
Argentina	July 25, 1969	July 24, 1999	No
Australia	May 28, 1957	May 27, 1997	Yes
Austria	Jan. 24, 1970	Jan. 23, 2014	Yes
Brazil	Sept. 20, 1972	Sept. 19, 2002	No
Canada	July 21, 1955	July 13, 1980	Yes
China, Rep. of	June 22, 1972	June 21, 2014	Yes
Finland	July 7, 1970	July 6, 2000	Yes
Italy	April 15, 1958	April 14, 1978	Yes
Japan	July 10, 1968	July 9, 2003	No*
Korea	March 19, 1973	March 18, 2014	Yes
Norway	June 8, 1967	June 7, 1997	Yes
Philippines	July 19, 1968	July 18, 1998	Yes
Portugal	June 26, 1974	June 25, 2014	No
South Africa	Aug. 22, 1957	Aug. 21, 2007	No
Spain	June 28, 1974	June 27, 2014	No
Sweden	Sept. 15, 1966	Sept 14, 1996	Yes
Switzerland	Aug. 8, 1966	Aug. 7, 1996	No*
Thailand	June 27, 1974	June 26, 2014	Yes
United Kingdom	July 21, 1955	July 20, 1976	Yes
Venezuela	Feb. 9, 1960	Feb. 8, 1980	No*

* Have signed, but not ratified, the NPT.

Table II. (cont.). List of Agreement Nations and their NPT Status

Country	Effective Date	Termination	Ratified NPT
	Research Agreements		
Columbia	March 29, 1963	March 28, 1977	No*
Greece**	Aug. 4, 1955	Aug. 3, 1974	Yes
Indonesia	Sept. 21, 1960	Sept. 20, 1980	No*
Iran	April 27, 1957	April 26, 1979	Yes
Ireland	July 9, 1958	July 8, 1978	Yes
Israel	July 12, 1955	April 11, 1977	No
Turkey	June 10, 1955	June 9, 1981	No*
Viet Nam, Rep.***	July 1, 1959	June 30, 1979	Yes
	Power Agreements		
India	Oct. 25, 1963	Oct. 24, 1993	No
United Kingdom	July 15, 1966	July 14, 1976	Yes
	International Cooperation		
EURATOM	Feb. 18, 1959	Dec. 31, 1985	
EURATOM (Add'l)	July 25, 1960	Dec. 31, 1995	
IAEA	Aug. 7, 1959	Aug. 6, 2014	

* Have signed, but not ratified, the NPT.

** Superseding, research and power agreement in abeyance; U.S. material by IAEA (NPT) safeguards and Greek "peaceful uses" guarantees.

*** In abeyance.

Atomic Energy Agency and two with EURATOM.* Table II lists these agreements by type and expiration date, and the adherence of agreement nations to the Non Proliferation Treaty.

Note that France is not on the list of nations with agreements with the United States. The French were party to an agreement for research and development which was terminated in 1966, the same year that France withdrew from NATO.

Comparative contents of agreements

The provisions of the agreements for cooperation can be divided into two categories: (1) measures to permit the transfer and use of nuclear information, materials, parts and facilities; and (2) measures to prevent the improper or illicit use of items supplied by the United States. In some agreements the United States is also committed to similar measures to prevent misuse of items transferred from the agreement nation to the United States.

Concerning transfer of nuclear science and technology, the agreements typically specify the intention of the parties to cooperate in civil use of nuclear energy and include provisions for:

--exchange of information,

--transfer of materials,

--access to facilities,

--cooperation between commercial organizations and persons,

---

* EURATOM is a regional, multinational nuclear organization that is part of the European Economic Community.

--supply of enriched uranium and other special nuclear materials,

--reprocessing of irradiated nuclear fuel, and

--title to special nuclear materials produced from U. S.-supplied materials.*

As for limitations and controls, the agreements include guarantees not to use transferred items for nuclear weapons or military purposes, to use them for civil purposes, and provisions for safeguards by the United States or the International Atomic Energy Agency. Table III lists the major provisions of three typical agreements, one with Portugal for research and power, one with Indonesia for research only, and one with the United Kingdom for power only. A detailed identification of provisions of agreements

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* Congress in writing the Atomic Energy Act of 1946 and the revision in 1954 defined three categories of nuclear materials affected by the legislation. The categories are source materials, special nuclear materials and byproduct materials which are defined as follows in the Atomic Energy Act of 1954 as amended:

> "The term 'source material' means (1) uranium, thorium, or any other material which is determined by the Commission to be source material; or(2) ores containing one or more of the foregoing materials, in such concentration as the Commission may by regulation determine from time to time.
>
> "The term 'special nuclear material' means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission determines to be special nuclear material, but does not include source material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.
>
> "The term 'byproduct material' means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

Note that under the first two definitions, the Commission (now the Energy Research and Development Administration) can add other items to these categories.

Table III

Comparison of Contents of Three Typical Agreements for Cooperation

Provision	Research and Power Portugal	Research only Indonesia	Power only United Kingdom
Definitions	x	x	x
Scope	x	x	x
Exchange of information	x	x	x
Transfer of materials & access to facilities	x	x	o
Responsibility of receiving party	x	x	x
Cooperation between persons	x	x	x
Materials for civil power applications	x	x	x
Supply of SNM other than enriched uranium	x	o	o
Enrichment of uranium supplied	x	x	x
Limitations on quantity of enriched uranium	x	x	x
Reprocessing of fuel, alteration of fuel elements	x	x	o
Produced SNM--title and transfer	x	x	o
Receiver's responsibility and indemnification	x	x	o
Limits on separative work	x	o	o
Guarantees	x	x	x
Commitment to civil use	x	x	o
U.S. rights	x	x	o
IAEA safeguards	x	x	x
Entry into force, term	x	x	x

for cooperation appears in Appendix I and a side-by-side comparison of the texts of provisions from typical agreements appears in Appendix II.

Contents of research and power agreements

The agreements for cooperation for nuclear research and power are the most comprehensive type in scope and content. They call for cooperation in achievement of uses of nuclear energy for peaceful purposes, a term which is not defined. As shown in Table IV, the agreements all include sections dealing with: definitions; exchange of information; access to facilities; transfer of materials, devices, equipment, and special nuclear materials; transactions between persons and organizations; reprocessing of nuclear fuel materials supplied by the United States after irradiation in the agreement nation; disposition of special nuclear materials produced in U.S. supplied materials; guarantees not to use the transferred items for nuclear weapons or military purposes; a commitment to use transferred items for civil purposes; and safeguards rights for the United States and IAEA safeguards. A few agreements provide for conversion or fabrication services involving U.S. supplied special nuclear materials.

Variations occur among provisions for materials to be transferred, conditions of transfer, supply of enriched uranium and enrichment services, limitations upon amounts of nuclear fuel materials to be transferred, reprocessing of U.S. supplied special nuclear materials after they have been irradiated, and disposition of additional special nuclear materials produced by such irradiation.

TABLE IV
CONTENTS OF RESEARCH AND POWER AGREEMENTS

	Argentina	Australia	Austria	Brazil	China	Finland	Italy	Japan	Korea	Norway	Philippines	Portugal	South Africa	Spain	Sweden	Switzerland	Thailand	Venezuela
Definitions																		
Parties, atomic weapon, byproduct material, equipment and devices, person, reactor, restricted data, safeguards, source material, special nuclear material.	X		X	X	X	X		X	X	X	X	X		X	X	X	X	
All of the above except safeguards definition.		X					X						X					X
Restricted Data																		
Outside the scope of the Agreement	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Scope of the Agreement																		
Cooperation in achievement of uses of nuclear energy for peaceful purposes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Materials of Interest																		
Materials to be transferred when not available commercially. Research facilities to be made available.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Equipment and devices related to agreed information exchange will be transferred.	X		X	X	X	X		X	X	X	X	X		X	X	X	X	X
Provisions on ma intenance of classified, patent, and security policies.																X		
Exchange of unclassified information on geology, exploration techniques, chemistry and technology of extracting uranium and thorium from their ores and concentrates, the chemistry, production technology, and techniques of purification and fabrication of uranium and thorium compounds and metal, including design, construction, and operation of plants.													X					
Responsibility for Applying Information and Materials																		
Disclaims reponsibility for accuracy and completeness of information.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Conditions for Transfer																		
Arrangements may be made between either Party or its authorized persons for transfer of equipment and devices, and materials other than SNM.	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Arrangements may be made for the transfer of SNM and for the performance of services related thereto.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Provision for transfer of SNM or related services provided that arrangements involving persons under the jurisdiction of the recipient nation will not be undertaken until the U.S. Government is notified by the recipient nation that these persons may undertake the necessary arrangements.			X															
Private individuals and organizations in either nation may deal directly with private individuals in the other nations for transfers of materials, equipment and devices and services related thereto.							X											

	Argentina	Australia	Austria	Brazil	China	Finland	Italy	Japan	Korea	Norway	Philippines	Portugal	South Africa	Spain	Sweden	Switzerland	Thailand	Venezuela
Enriched and Special Nuclear Material																		
[ERDA may transfer enriched uranium to the recipient nations, under agreed terms and conditions, for research and power uses. Suitable research uses include: reactor experiments, and reactors for research, materials testing, and experimental, scientific and industrial uses. The enriched uranium supplied may contain up to 20% in the isotope U-235. A portion of the uranium may contain more than 20% if ERDA determines that there is a technical or economic justification for the transfer. The amount of enriched uranium transferred under an agreement and placed under the jurisdiction of another nation may not exceed the quantity necessary for fueling the reactors or reactor experiments involved plus an additional quantity that is determined by the parties to be necessary for the efficient and continusous operation of the reactors. Upon the request of a recipient nation, ERDA, at its option, may sell enriched uranium to the recipient nation under agreed terms and conditions.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
[ERDA will provide enrichment services subject to the availability of enrichment capacity and the amounts authorized by the agreements. When the recipient nation or authorized persons are ready to execute firm contracts for enrichment services they will have equitable access with other purchasers to available enrichment capacity which has not already been allocated. Contract and price provisions are not included.			X		X			X	X			X	X	X	X	X	X	
The U.S. ERDA is committed to supply enriched uranium for the research and power programs described in the agreements. If natural uranium is not available to the recipient nation for enrichment, the U.S. agreed to furnish it on terms and conditions to be agreed upon. In the event of transfer of title to enriched uranium, ERDA has the option to limit the arrangements to undertakings described in the agreements.	X	X		X		X	X			X	X							
Contract and price provisions included.	X	X		X		X				X	X							X
ERDA will supply enriched uranium to the same extent as to U.S. licensees.	X			X		X					X							
[ERDA will provide enriched uranium for maritime applications.	X																	
ERDA may transfer up to 10 kilograms of uranium enriched un U-233 under terms and conditions agreed to in advance.										X								
ERDA may make (available) up to 8 kg of U-235 enriched to ninety percent for use in research reactors, materials testing reactors, and reactor experiments. The recipient nation can allow its authorized users to acquire the title to uranium that it had purchased from the U.S.							X											
Plutonium may be transferred to the recipient government or its authorized agents for use as fuel in reactors and reactor experiments under terms and conditions agreed upon in advance of each transfer.	X			X														
[U.S. responsibility for supplying special nuclear material or enrichment services to private enterprise under U.S. jurisdiction.				X														

↑ may be transferred

	Argentina	Australia	Austria	Brazil	China	Finland	Italy	Japan	Korea	Norway	Philippines	Portugal	South Africa	Spain	Sweden	Switzerland	Thailand	Venezuela
Responsibility for Safe Handling Materials																		
After delivery, (the) recipient nation bears all responsibility for safe handling and use of materials and equipment transferred.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Amount of Materials to be Produced or Transferred																		
Amount of separative work limited to that needed to support the fuel cycle of a specific installed reactor capacity which is designated in each agreement.			X		X			X	X			X	X	X	X	X		
Includes formula for amount of enriched uranium to be transferred.	X	X		X		X				X	X							
Net amount of enriched uranium not to exceed 7,000kg of U-235							X											/
Net amount of enriched uranium not to exceed 25 kg. net.																		X
Limitations on the amount of plutonium to be transferred.	X			X				X										
Reprocessing																		
Reprocessing of fuel material received from the U.S. will be in facilities acceptable to both Parties under a joint determination that safeguards will be effectively applied. SNM produced by irradiation of fuel leased by the U.S. will be credited to the account of the lessee after reprocessing and title will be transferred to the lessee unless otherwise agreed.			X		X				X			X	X	X	X	X	X	X
Irradiated SNM of U.S. origin may be transferred from third countries for chemical reprocessing and subsequent application within that nation under agreed terms, conditions, and quantities.														X				
Reprocessing may be performed in the recipient nation upon a joint determination by the Parties that the safeguards of the bilateral agreement will be effectively applied. Reprocessing may also be performed in mutually agreed facilities.	X			X		X		X										
Reprocessing to be performed at the discretion of the U.S. ERDA in U.S. ERDA facilities of facilities acceptable to the U.S. on terms and conditions to be agreed upon. (formand content of irradiated fuel elements is not to be altered after their removal from the reactor core prior to delivery for reprocessing)		X					X			X	X							
Conversion and/or Fabrication Services																		
Either party or their authorized persons are authorized to receive material for the performance of conversions and/or fabrication services under agreed terms and conditions. The processed material will then be returned to the territory of the nation from which it was transferred or transferred to another nation or international organization in accordance with the provisions of this agreement.								X										
Special nuclear material may be transferred to the recipient nation or its authorized persons for performance of conversion and/or fabrication services and for subsequent transfer to another nation or group of nations in accordance with this agreement and under agreed terms and conditions.						X									X			
The recipient nation, under terms and conditions agreed to for each transfer, may receive SNM for the performance of conversion and/or fabrication services for subsequent transfer to a nation or group of nations with which the U.S. has an applicable Agreement for Cooperation.									X									

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	Argentina	Australia	Austria	Brazil	China	Finland	Italy	Japan	Korea	Norway	Philippines	Portugal	South Africa	Spain	Sweden	Switzerland	Thailand	Venezuela
Disposition of SNM Created from U.S. Material																		
No special nuclear material produced through the use of material transferred to the recipient nation or its authorized persons may be transferred to another nation or group of nations unless such nation has an appropriate agreement for cooperation with the U.S. Government or guaranteed the use of such SNM for peaceful purposes under safeguards acceptable to the Parties.			X					X	X			X	X		X		X	
No SNM produced through the use of material transferred to the recipient government or its authorized persons will be transferred to any other nation or group of nations except as ERDA may agree.	X			X	X	X								X		X		X	
Concerning SNM not owned by the U.S. Government which is produced in reactors while fueled with materials obtained from the U.S. by means other than lease which is in excess of the needs of the recipient nation's program for peaceful uses of atomic energy, the U.S. has the first option to purchase this material at prevailing U.S. prices and the right to approve the transfer of such material to any other nation or group of nations if the option to purchase is not exercised.		X					X			X	X								
Guarantees																		
Recipient nation guarantees: (1) safeguards will be maintained; (2) no items under this Agreement to be used for atomic weapons, r & d on atomic weapons, or other military purposes; (3) no transfers of items originally transferred under this Agreement to be transferred to unauthorized persons unless within the scope of an Agreement for cooperation with the U.S.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
[The U.S. guarantees that no equipment or devices transferred to it by the other Party will be used for atomic weapons, r & d on atomic weapons or for any other military purpose.															X	X		
[The U.S. makes the same guarantees (except to maintain safeguards) as the recipient nation.	X	X		X		X		X										
Safeguards																		
The Nations emphasize their common interest in using items transferred solely for civil purposes. U.S. has rights to: review the design of reactors and equipment, require maintenance and production of operating records and request reports; require the deposit in storage facilities designated by the U.S. of SNM not currently utilized for civil purposes in the recipient nation; designate personnel who shall have access in the recipient nation to all places and data necessary to account for SNM; to suspend or terminate the agreement and require the return of material, equipment, devices in the event of non-compliance with the provisions; and to consult with the recipient on matters of health and safety.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
[The U.S. Govt. will direct the persons it designated to have access to items and places in the recipient nation not to reveal any industrial secrets or confidential information revealed through their official obligations.	X			X	X			X										
Includes a note stating the long held U.S. understanding that no material, subject to the Agreement for Cooperation will be used for any nuclear explosive device, regardless of how the device is intended to be used.												X	X	X				

C I D

	Argentina	Australia	Austria	Brazil	China	Finland	Italy	Japan	Korea	Norway	Philippines	Portugal	South Africa	Spain	Sweden	Switzerland	Thailand	Venezuela
IAEA Safeguards																		
Parties note that under a trilateral agreement the IAEA has been applying safeguards to materials, equipment and facilities transferred to the jurisdiction of the recipient nation. Parties recognize the desirability of continuing to use facilities and services of IAEA. IAEA safeguards are to continue to apply to all items transferred under the Agreement. U.S. safeguards are suspended during the application of IAEA safeguards.	X		X	X	X			X	X			X	X	X	X		X	
The Parties note that they have been applying IAEA safeguards to materials, equipment and facilities transferred to the recipient nation. The Parties agree that IAEA safeguards should continue to apply to those items transferred under the agreement. U.S. safeguards rights are suspended during the time and to the extent that IAEA safeguards apply.		X									X							X
IAEA will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement. The Parties contemplated that the necessary arrangements would be effected without modification of the Agreement through an agreement to be negotiated between the Parties and the IAEA which might include provisions for suspension of the safeguards rights accorded to the U.S. under this Agreement. If the Parties did not reach a mutually satisfactory agreement on the terms of the trilateral arangement, either Party could terminate the agreement.						X				X						X		
Both parties affirmed their interest in the establishement of an international atomic energy agency. If such an agency is formed, the Parties would consult with each other to determine how the Agency could administer safeguards under this Agreement. If the Parties fail to reach agreement about the role of the international agency, either Party could by notification, terminate the Agreement.							X											
Termination of IAEA Safeguards																		
If IAEA trilateral safeguards are terminated, the U.S. is to reassume the safeguards rights referred to in the Agreement. Then the Parties are to examine the situation in the light of the obligation assumed by the U.S. under the NPT to determine what measures could be taken to comply with the NPT.												X						
If the IAEA trilateral safeguards are terminated and the Parties fail to promptly agree (within three months for Brazil) upon a resumption of IAEA safeguards, either Party can by notification, terminate the Agreement. Before either Party takes steps to terminate, the Parties are to carefully consider the economic effects of termination. Neither Party is to invoke termination rights until the other Party has been given sufficient advance notice to permit arrangements (alternatives). The recipient nation is to return to the U.S. all SNM received under the Agreement and still in its possession or persons under its jurisdiction. The U.S. is to compensate the recipient nation for the material.	X		X	X		X		X		X				X		X		
If the trilateral safeguards agreement is terminated prior to the Agreement, and the Parties fail to promptly to resume IAEA safeguards, either Party may by notification, terminate the Agreement. In the event of termination, the recipient nation is to, at the U.S. request, return to the U.S. all SNM received under the Agreement. The U.S. is to compensate the recipient nation.		X			X		X		X		X		X		X		X	X
The U.S. Government is to reassume the safeguards rights referred to in the agreement. The the Parties are to examine the situation in the light of the obligation assumed by the U.S. under the terms of the NPT so that appropriate measures can be taken, if necessary, to comply satisfactority with those obligations.												X						

Contents of Research agreements

Of eight research agreements negotiated, seven are still in effect. The one with Viet Nam has been in abeyance since the fall of that government. The research agreements also begin with a commitment to cooperation in the achievement of the use of nuclear energy for peaceful purposes, which also are not defined. As shown in Table V, they are similar in content to the research and power agreement as to kinds of terms and conditions. The principal differences lie in the amounts of nuclear fuel materials to be made available and the supply of enrichment services. Four of the agreements extend the cooperation to include power reactors while three are limited to cooperation concerning research reactors.

International agreements

Among the U.S. agreements for cooperation are three with international organizations: one with the International Atomic Energy Agency and two with EURATOM.

The agreement with the International Atomic Energy Agency.--In 1957 Congress passed the International Atomic Energy Agency Participation Act, which provided for the participation of the United States in the activities of the Agency.* Subsequently, in 1959, the United States and the Agency concluded an agreement for cooperation. The agreement deals primarily with U.S. supply of source and special nuclear materials, including provisions for:

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* Public Law 85-177, 71 Stat. 453.

TABLE V
RESEARCH AGREEMENTS

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	Colombia	Greece	Indonesia	Iran	Ireland	Israel	Turkey
Definitions							
For commission, equipment and devices, research reactor, restricted data, atomic weapon and special nuclear material.		X		X		X	X
Same definitions as above plus definitions for parties, byproduct material and person.	X						
all of the above plus definition for safeguards			X		X		
Cooperation and Restricted Data							
Parties agree to cooperate in the achievement of the uses of atomic energy for peaceful purposes subject to the provisions of the Agreement, the availability of personnel and material, and applicable laws, regulations, and license requirements in force. Restricted data and information that the Parties are not permitted to communicate are outside the scope of the agreement.			X		X		
Only provide that restricted data shall not be communicated under the Agreement.	X			X		X	X
No mention of restricted data.		X					
Scope							
Development, design, construction, operation of research reactors, use of radioactive isotopes etc, in research, health and safety. Information exchange by reports, conferences and visits.							
Materials to be transferred when they are not available commercially. Research facilities made available. Equipment and devices related to agreed information to be transferred.	X		X		X		X
Design, construction, and operation of research reactors and their use as research, development, and engineering tools and in medical therapy. Health and safety problems related to the operation and use of research reactors. The use of radioactive isotopes in physical and biological research, medical therapy, agriculture and industry.		X		X		X	
Responsibility for Accuracy of Information							
Disclaims responsibility for the accuracy of the information and data transferred.	X	X	X	X	X	X	X
Enriched Uranium							
U.S. Commission (now ERDA) will sell or lease uranium enriched up to 20% in U-235 except as otherwise provided. This U-235 will be provided in agreed quantities for fueling defined research reactors, materials testing reactors and reactor experiments. The recipient will consult with the U.S. about building the reactors. The net amount of uranium sold or leased under the Agreement will not at any time exceed a determined number of kilograms of contained U-235. The amount of enriched U-235 transferred to the other Party by the U.S. shall never be in excess of the quantity necessary for the full loading of each defined reactor project plus an additional quantity, which in the opinion of the U.S. Commission (ERDA) is necessary for the efficient and continuous operation of the reactors. All or a portion of the SNM may be made available as uranium enriched to more than 20% U-235 by weight where there is a technical or economic justification. This amount shall not exceed a set amount of U-235.	X					X	X

	Colombia	Greece	Indonesia	Iran	Ireland	Israel	Turkey
Enriched Uranium (cont'd)							
U.S. Commission (ERDA) shall provide the Other Party or persons under its jurisdiction with uranium enriched in U-235 for use as fuel in defined research applications. Contracts setting forth terms, conditions, and delivery schedules will be agreed upon in advance. The net amount transferred during the term of the Agreement will not exceed 25 kg. The amount of U-235 shall not exceed the necessary amount plus some addition for operating needs. All or a portion of the SNM may be made available as uranium enriched to more than 20% if there is a technical or economic justification for such a transfer for use in research reactors, each capable of operating with a fuel load of not more than eight kilograms of contained U-235.			X		X			
The U.S. Commission (ERDA) will transfer uranium enriched in U-235 to the other Party or its authorized persons for use in defined research application. Contracts setting forth the terms, conditions, and delivery schedule will be agreed upon in advance. The quantity of enriched U-235 transferred will not at any time be in excess of 6 kg. of contained U-235 in enriched uranium plus additional quantities needed for efficient reactor operations. The enriched uranium supplied may contain up to twenty percent U-235. All or a portion of the SNM may be made available as uranium enriched to more than 20% when the U.S. Commission (ERDA) finds there is a technical or economic justification for such a transfer for use in research reactors, each capable of operating with a fuel load not to exceed six kg of contained U-235.		X		X				
Reprocessing							
When the source or special nuclear material received from the U.S. requires reprocessing, it shall be performed at the discretion of the U.S. ERDA with in its facilities or facilities acceptable to ERDA on terms and conditions to be agreed later. Except as otherwise agreed, the form and content of any irradiated fuel shall not be altered after its removal from the reactor and prior to delivery to the ERDA or other accepted facilities.	X	X	X	X	X	X	X
Disposition of SNM Produced by Irradiation of U.S. Material							
SNM produced from the irradiation of fuel leased hereunder shall be for the account of the recipient party. After reprocessing it shall be returned to the recipient, at which time title to the material will be transferred to that Government, unless the U.S. exercises its option to retain the material while crediting the other nation for such material in its program for the peaceful uses of atomic energy. Concerning SNM not subject to the above options but which is produced from reactors fueled with U.S. material and is in excess of the need of the other Party's peaceful atomic program, the U.S. shall have the first option to purchase such excess material at prevailing U.S. prices. The U.S. also has the right to transfer such material to any other nation or international organization in the event the purchase option is not exercised.	X	X			X	X	X
SNM produced as a result of irradiation processes in any part of fuel leased by ERDA hereunder shall be for the account of the lessee and, after reprocessing, shall be returned to the lessee at which time title to such material shall be transferred to the lessee. ("unless the Commission and the lessee other wise agree" in the Indonesian agreement) No SNM produced through the use of material transferred to these nations or their authorized persons under the Agreement will be transferred to any other nation or group of nations, except as ERDA may agree.			X	X			
Liability							
The U.S. disclaims liability for the use of material and other items which it supplies under this agreement.	X	X	X	X	X	X	X

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	Colombia	Greece	Indonesia	Iran	Ireland	Israel	Turkey
Materials of Interest U.S. ERDA will sell or lease to the other party or its authorized persons such reactor materials other than SNM which are required in the construction and operation of those nation research reactors. The sale or lease of these materials shall be on terms as may be agreed. Materials of interest in connection with defined research projects relating to peaceful uses of atomic energy include source materials, SNM, byproduct materials, other radioisotopes, and stable isotopes. These will be sold or transferred to the other party for research purposes other than fueling reactors and reactor experiments in such quantities and under such terms and conditions as may be agreed when they are not available commercially.						X	X
Materials of interest in connection with the subjects of agreed information exchange including: source material, heavy water, byproduct material, other radioisotopes, stable isotopes, and SNM for purposes other than fueling reactors and reactor experiments may be transferred between the parties for defined applications in quantities, and under terms and conditions to be agreed when they are not available commercially. Research facilities will be made available. Equipment and devices related to agreed information exchange will be transferred.			X		X		
Materials of interest in connection with defined research projects related to the peaceful uses of atomic energy undertaken by the other Party, including source material, special nuclear material, byproduct material, other radioisotopes, and stable isotopes will be exchanged for research purposes in such quantities and under such terms and conditions as may be agreed when such materials are not available commercially.	X			X			
Materials of interest can be transferred to persons under the jurisdiction of the recipient nation.	X						
The U.S. ERDA will sell or lease required reactor materials other than SNM which are not available commercially through appropriate means to the recipeint nation or authorized persons under its jurisdiction. The sale or lease of these materials will be on agreed terms. These materials include source materials, SNM, byproduct material, other radioisotopes and stable isotopes. In no case shall the materials at any one time be in excess of 100 grams of contained U-235, 10 grams of U-233, 250 grams of Pu in the form of fabricated foils and sources, and 10 grams of Pu.		X					
Safeguards The Nations emphasize their common interest in using items transferred solely for civil purposes. U.S. has rights to: Review the design of reactors and equipment, require maintenance and production of operating records and to request reports, require the deposit in storage facilities designated by the U.S. of SNM not currently utilized for civil purposes in the recipient nation, designate personnel who shall have access in the recipient nation to all places and data necessary to account for SNM, to suspend or terminate the agreement and require the return of material, equipment, devices in the event of non-compliance with the provisions, to consult with the recipient on matters of health and safety.	X	X	X	X	X	X	
Agrees to maintain such safeguards as are necessary to assure that the enriched uranium leased from the U.S. ERDA shall be used solely for the purposes of this Agreement and to assure the safekeeping of the material; reactor materials purchased in the U.S. are used solely for the design, construction and operation of research reactors; records are maintained.							X
Includes a note stating the U.S. understanding that no material subject to the Agreement for Cooperation will be used for any nuclear explosive device, regardless of how the device is intended to be used.						X	

63C

	Colombia	Greece	Indonesia	Iran	Ireland	Israel	Turkey
The recipient nation agrees to maintain such safeguards as are necessary to assure that the enriched uranium leased from the U.S. Commission shall be used solely for purposes of the Agreement and assure the safekeeping of the material; safeguards necessary to assure that reactor materials purchased in the U.S. under the Agreement will be used solely for the design, construction, and operation or research reactors; records relating to the power levels of operation and burnup of reactor fuels. If the U.S. ERDA requests it may send a representative to observe the performance of the reactor in which U.S. material is used.							X
IAEA Provisions Trilateral agreements are noted. The IAEA has been applying safeguards to materials, equipment and facilities transferred to the recipient nation under this agreement. The Parties agree that Agency safeguards, as provided in the trilateral agreement and as may be amended or supplanted by a new trilateral, shall continue to apply to materials, equipment and facilities transferred under this agreement. Safeguards rights accorded to the U.S. Government by this Agreement are suspended during the time and to the extent that Agency safeguards apply.			X	X			
The parties recognize the desirability of making use of IAEA facilities and services and agree that prior to the transfer ("promptly" for Colombia and Greece) to the recipient of any materials or facilities subject to safeguards under this Agreement, the Agency will be requested to assume responsibility for applying safeguards to such materials and facilities. The Parties contemplated that the necessary arrangements could be effected without modification of this Agreement through an agreement to be negotiated among the parties and the Agency which could include provisions for the suspension of U.S. safeguards rights during the time that IAEA safeguards apply. In the event that the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement, either Party may, by notification, terminate this Agreement.	X	X			X	X	
The application of safeguards under this Agreement will be carried out in accordance with the multilateral safeguards transfer agreement signed by the recipient nation, the U.S. and the IAEA or in accordance with a safeguards agreement between the recipient nation and the IAEA under Article III of the NPT. The U.S. safeguards rights accorded under this Agreement will be suspended during the time and to the extent that the U.S. agrees that the need to exercise such rights is satisfied by the safeguards contemplated in this paragraph.							X
Termination If the trilateral should be terminated prior to the expiration of this agreement and the Parties should fail to promptly agree upon a resumption of IAEA safeguards, either Party may, by notification, terminate this Agreement. In the event of termination by either Party, the recipient nation shall, at the request of the U.S., return to it all SNM received pursuant to this Agreement and still in the recipient's possession or the possession of persons under its jurisdiction. The U.S. will compensate the recipient nation or persons under its jurisdiction for their interest in such material at the U.S. ERDA's schedule of prices then in effect in the U.S.	X	X	X	X	X	X	
No termination provisions.							X

63 D

	Colombia	Greece	Indonesia	Iran	Ireland	Israel	Turkey
Guarantees							
Recipient nation guarantees that the safeguards provided in the Agreement will be maintained. No material, including equipment and devices transferred to the recipient nation or its authorized persons by lease, sale, or otherwise, will be used for atomic weapons, r & d on atomic weapons or for any other military purposes. No such material will be transferred to unauthorized persons or beyond the jurisdiction of the recipient nation except as the U.S.(ERDA)may agree to such a transfer. The transfer will be agreed to only if,it fallswithin the scope of an agreement for cooperation between the U.S. and the recipient nation.	X					X	X
Recipient nation guarantees. Safeguards will be maintained. No items under this Agreement to be used for atomic weapons, r & d on atomic weapons, or other military purposes. No tranfers of items originally transferred under this Agreement to be transferred to unauthorized persons unless within the scope of an Agreement for cooperation. with the U.S.		X	X	X	X		
Further Cooperation							
The Parties hope and expect that the initial Agreement for Cooperation will lead to the consideration of further cooperation. Accordingly, the Parties will consult with each other concerning the feasibility of an additional agreement with respect to the production of power from atomic energy.				X	X	X	X
No provisions for further cooperation.	X	X	X				
Expiration of Agreement							
At the expiration of this Agreement or any extension thereof the recipient nation will deliver all fuel elements containing reactor fuels and reactor materials leased by ERDA to a site in the U.S. designated by ERDA. The expense of the delivery will be borne by the original recipient nation and made under appropriate safeguards against radiation hazards.	X	X		X	X	X	X

--The supply for use in Agency activities of 5,000 kilograms of contained uranium-235 together with "amounts of special nuclear material which will match in amount the sum of all quantities of special nuclear material made available by all other Members of the Agency prior to July 1, 1960." The United States also is committed to make available to the Agency such additional quantities of special nuclear materials "as may be authorized by the United States." Enrichment is limited to 20 percent provided, however, the parties may agree to a higher enrichment for uranium to be used in research reactors, in material testing reactors or for research purposes. Note the absence of the approval by the Energy Research and Development Administration for supply of more highly enriched material.

--The special nuclear material made available to the Agency will be used or distributed under its direction. The United States will retain such material until needed by the Agency and will deliver it upon request to the Agency or to a Member or group of Members designated by the Agency. At such times the parties shall agree on the compensation for such material, its form and composition and delivery schedule and related matters.*

--The United States is committed to assist the Agency in obtaining source and reactor materials from persons within U.S. jurisdiction if the Agency wishes. If no commercial sources are available to the Agency on reasonable terms, the United States may make such material available to the Agency or to Members designated by it under terms to be agreed upon.

--The United States is also committed, at the request of the Agency and subject to laws of the United States, to purchase, solely for peaceful

uses, special nuclear material recovered or produced from special nuclear material and source material as a result of Agency activities, at such prices and on such other terms and conditions as may be agreed.

--The United States also has agreed that persons under U.S. jurisdiction will be permitted to make arrangements to transfer and export material, equipment or facilities and to perform services for the Agency or upon request of the Agency for a Member or group of Members in connection with an Agency activity. This commitment is subject to applicable laws, regulations and license requirements of the United States.

The Agency made three guarantees that resemble those typical of other agreements, but are slightly different. It guarantees, to the full extent of its statutory powers, that:

a. The safeguards set forth in the Agency statute shall be maintained and implemented as provided in the Agency statute with respect to material, equipment or facilities, made available by the United States or persons under its jurisdiction for use in Agency activities.

b. No material, equipment or facilities, transferred pursuant to this Agreement will be used for atomic weapons or for development of atomic weapons or for any other military purposes.

c. Material, equipment or facilities used, transferred or retransferred pursuant to this Agreement shall be used or transferred only in accordance with the Agency Statute and this Agreement.

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* Note, the first Director General of the Agency attempted to get the United States to supply special nuclear materials at a special low price so that the Agency could fund some of its operations by a markup of the price of U.S. materials for Agency resale. This proposal was turned down and U.S. policy has been for the Agency to pay the same price as any other customer.

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The agreements with EURATOM.--The United States entered into its initial agreement for cooperation with the European Atomic Energy Community (EURATOM) in 1958. The agreement has been revised several times, with the latest version signed on September 20, 1972. It is based upon both section 123 of the Atomic Energy Act of 1954 as amended and the EURATOM Cooperation Act of 1958.*

Terms of the agreement for cooperation with the Community are similar to those of other agreements for cooperation for research and power. The agreement differs from these other agreements in two respects: establishment of a joint program of research and development and construction of several nuclear powerplants, and establishment of safeguards for the European Community.

The purpose of the joint program was twofold: to bring into operation nuclear powerplants with a total capacity of about 1,000 megawatts by the end of 1963, and to immediately initiate a joint research and development program centered on the types of reactors to be used.**

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* Public Law 85-846, 72 Stat. 1084.

** The original agreement committed the United States and the Community to cooperate by establishing a joint program that would, in part, "...bring into operation within the European Atomic Energy Community (EURATOM) large-scale powerplants using nuclear reactors of types on which research and development have been carried to an advanced stage in the United States, having a total installed capacity of approximately one million kilowatts of electricity by December 31, 1973 (except that two reactors may be selected to be in operation by December 31, 1965), and under conditions which would approach the competitive range of conventional energy costs in Europe."

The cooperative program reached an early peak and by 1968 had come to its end. In retrospect, the agreement for cooperation provided a foundation for a joint undertaking but could not assure the impetus to reach the desired goals. The agreement did not produce a truly joint undertaking in research and development but rather two parallel national programs in which each Party controlled its own funds. The agreement did culminate in the construction in Europe of several prototype nuclear powerplants that demonstrated U.S. nuclear technology for both the European and domestic U.S. nuclear markets. It also provided useful experience in the organization and operating of joint boards, experience that perhaps could be useful for future multinational ventures such as regional fuel reprocessing plants. It may be worth inquiring how much of this experience from the joint U.S.-EURATOM program was recorded and analyzed by the U.S. Atomic Energy Commission for future reference.*

The safeguards provisions are unusual for they provide for multinational rather than national safeguards. The Community committed itself to establish and maintain a mutually satisfactory system of safeguards and control to be applied to nuclear materials, equipment and devices.**

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* A detailed account of U.S. cooperation with Euratom appears in chapter VIII of the report, Commercial nuclear power in Europe: the interaction of American diplomacy with a new technology, which was prepared for and issued by the Subcommittee on National Security Policy and Scientific Developments of the House Committee on Foreign Affairs in December 1972 as a committee print.

** The agreement provides for the Community to undertake the responsibility for "...establishing and implementing a safeguards and control system designed to give maximum assurance that any material, equipment or devices made available pursuant to this Agreement and any source or special nuclear material derived from the use of such material, equipment and devices, shall be utilized solely for peaceful purposes."

Safeguards for technology are not mentioned. The Community is also committed to consult with and exchange experiences with the International Atomic Energy Agency with the objective of establishing a system reasonably compatible with that of the Agency. In an unusual provision, the Community and the United States agreed upon principles to govern the establishment and operation of safeguards by the Community. The text of these principles appears in Appendix IV. The agreement is unusual too in that it includes no rights for United States inspection of materials and facilities and verification that their use complies with the agreement. The United States has some influence over safeguards in the U.S. commitment to provide assistance in establishing the Community's safeguards and control system and to provide continuing assistance in its operation. The Parties also agreed to frequent consultations and exchanges of visits to give assurance to both Parties that the Community's safeguards and control system effectively meet the responsibility and principles specified in the agreement, and that the standards of the materials accountability systems of the United States and the Community are kept reasonably compatible.

VI. COMMENTARY

The examination of U.S. agreements for nuclear cooperation has provided some background for their purpose, their general content and specific provisions. What remains to be discussed is the accomplishments of the agreements and their past, present and future implications for limiting further proliferation of the manufacture of nuclear weapons among nations of the world and the possibility that terrorists or other subnational groups might seek to get and to use nuclear devices.

The following discussion briefly assesses the accomplishments of the agreements for cooperation, their likely effect on proliferation, and the changing times and conditions as a factor affecting the use of agreements; and provides some commentary on specific provisions, or the lack thereof, for U.S. agreements for nuclear cooperation.

On the whole, the use of agreements for cooperation by the Department of State, the U.S. Atomic Energy Commission and the Energy Research and Development Agency has fulfilled the goal of Atoms for Peace of sharing United States nuclear technology with the other nations. Under their use, U.S. exports of nuclear materials and facilities apparently have not been directly used to make nuclear weapons, and U.S.-furnished nuclear materials have been accounted for and safeguarded. On the other hand, the use of nuclear power has not slowed the growth in nuclear arsenals by diverting fissionable materials to peaceful uses. Instead, a plateau in manufacture of weapons has opened up a major supply of fuel for civil nuclear

power. The U.S. agreements for cooperation have obtained for the United States unique concessions from other sovereign nations, particularly the right to send our inspectors or those of the International Atomic Energy Agency into an agreement country to inspect use of U.S.-supplied materials and equipment.

The agreements have provided a framework for growing exports by the U.S. nuclear industry, and a channel for U.S. influence through our supply of enriched uranium by lease, sale, or contracts for enrichment services. On the other hand, the agreements have not been a sure way of influencing nations that would wish to make nuclear weapons or that would permit their nuclear industries to export products or technology that the United States considers to be undesirable.

The times and conditions have changed substantially from 1955 when the agreements were authorized until today when many nations have nuclear powerplants, some have factories that can produce nuclear materials suitable for weapons, and others have industries capable of exporting nuclear powerplants and the technology and equipment for nuclear fuel material production. The times seem likely to change as much during the coming two decades.

Therefore, at issue for Congress is how the agreements function today, how well they are likely to function for the years ahead, and what is to be expected of them in support of national policy to limit proliferation.

Effects of the agreements upon proliferation

Judging the effects of U.S. agreements for cooperation upon proliferation is uncertain at best and disagreement by other analysts is as likely

as agreement. Nevertheless, judgments are needed so that they may be compared both for similarities and differences.

On the whole, the U.S. agreements for cooperation probably have increased the long-term probability of further proliferation by helping many nations of the free world to acquire a nuclear industrial and technological base that they can use, if they wish, to produce nuclear materials needed for weapons and to make them.

The agreements so far have apparently not caused proliferation by enabling a nation to divert or misuse nuclear materials and equipment transferred to it from the United States, nor have U.S.-supplied nuclear materials been reported stolen by terrorist or subnational groups.

On the other hand, the U.S. agreements do not require an agreement nation to place all of its nuclear activities under international safeguards or to declare and safeguard facilities that may be made by its nationals based upon U.S. training and U.S.-supplied information, data and technology. Whether the agreements could be renogiated to require such commitments is an open question both as to desirability and practicability.

Concerning the proliferation effect of various provisions of agreements for cooperation, Table VI is a speculative attempt to suggest the potential effects. It suggests that measures to discourage nations abroad from acquiring their own factories to enrich or to reprocess nuclear fuels could be one way to reduce the future potential for proliferation. However, for the United States to reshape its agreements for cooperation for this purpose would require decisions substantially affecting the domestic nuclear industry

TABLE VI.

POTENTIAL EFFECTS OF AGREEMENT PROVISIONS ON PROLIFERATION OF NUCLEAR WEAPONS

Provision	Effect on Civil Use		Effect on Nuclear Base		Effect on Production of Nuclear Weapons		
	Industrial Nation	Developing Nation	Industrial Nation	Developing Nation	Industrial Nation	Developing Nation	Subnational Group
Exchange of information:	+	+	+	+	+	+	+
Scientific	+	+	+	+	+	+	+
Technological	+	+	-	-	+	+	+
Training and education	+	+	+	+	+	+	+
Supply of:							
Nuclear power plants	+	+	-	-	+	+	+
Nuclear fabricated fuel	+	+	-	-	+	+	+
Source materials	+	+	-	-	+	0	0
Non nuclear materials*	+	+	-	0	+	+	0
Enriched uranium	+	+	-	-	+	+	+
Enrichment plants	+	+	+	+	+	+	+
Fuel reprocessing services	+	+	-	-	-	-	-
Fuel reprocessing plants	+	+	+	+	+	+	+
Access to special facilities	+	+	+	+	+	+	NA
Safeguards -U.S.							
Accounting and inspection	0	0	0	0	-	-	-
Physical security	0	0	0	0	-	-	-
Safeguards - IAEA							
Design review	0	0	0	0	-	-	0
Reporting	0	0	0	0	-	-	-
Inspection	0	0	0	0	-	-	-
Limits on transfer of enrichment and reprocessing information	0	0	-	0	-	-	0
Guarantees of no weapon application	0	0	0	0	-	-	0
Commitment to civil use only	0	0	0	0	-	-	0

*Heavy water, graphite

KEY:

+ = Positive effect (i.e. enhances use of nuclear power or increases the probability of proliferation.)

0 = Uncertain or little effect

- = Negative effect (i.e. Inhibits the use of nuclear power, or decreases the probability of proliferation.)

concerning expansion of enrichment service, low-price and reliable nuclear fuel reprocessing and low-price supply of special materials such as heavy water. Reducing the potential of other nations to acquire nuclear weapons materials by creating a United States or perhaps a world monopoly of supply, maintained by uneconomic pricing, could be effective, but would surely require expensive subsidy.

Agreements to agree

Many provisions of agreements for cooperation call for or imply future negotiation of contracts or other arrangements and in some cases determinations or judgments. These subordinate arrangements cover detailed terms and conditions for supply of materials, equipment, special nuclear materials, enrichment of uranium, ceilings upon amounts of special nuclear materials held by agreement nations, transfers to other nations, and various safeguards provisions. Some of the arrangements are subject to joint agreements of the Parties, some are unilateral determinations by the Energy Research and Development Administration. Table VII identifies such subordinate arrangements found in the examination of the agreements.

Note the anomoly presented by some of these arrangements. For special nuclear materials, the Energy Research and Development Administration is authorized to permit reexport of U.S.-supplied special nuclear material, whereas the initial export probably required a license from the Nuclear Regulatory Commission.

Accomplishment of the agreements for cooperation

Using the authority of section 123 of the Atomic Energy Act of 1954 to support the goals for Atoms for Peace, the U.S. Atomic Energy Commission

Table VII. Provisions of Agreements for Cooperation that Require Additional Negotiations and Decisions

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The following provisions in a typical agreement for cooperation for research and power indicate the many negotiations of subordinate arrangements and contracts and exercises of judgment and decisions required by the Energy Research and Development Administration.

Supply of materials

Certain listed materials may be transferred for defined applications in such quantities and under such terms and conditions as may be agreed when such materials are not commercially available.

Specialized research facilities and reactor materials testing facilities may be made available under such terms and conditions as may be agreed.

Equipment and devices may be transferred under such terms and conditions as may be agreed.

Supply of enriched uranium

ERDA at its option and under terms and conditions to be agreed may sell enriched uranium for transfer for use as fuel in power applications.

Under such terms and conditions as may be agreed, ERDA may transfer enriched uranium (including inter alia supply through enrichment services contracts) to the agreement or authorized persons under its jurisdiction.

Enrichment of transferred uranium

Some uranium transferred may be enriched to more than 20 percent when ERDA finds there is a technical or economic justification for such a transfer.

Limitations on quantities of enriched uranium transferred

The quantity of enriched uranium transferred for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments plus such additional quantity as, in the opinion of the Parties, is necessary for the efficient and continuous operation of such reactors or reactor experiments.

Table VII (cont.). Provisions of Agreements for Cooperation that Require Additional Negotiations and Decisions

Reprocessing of irradiated U.S. materials
U.S. nuclear fuel materials irradiated in the agreement nation may be altered or reprocessed only in facilities acceptable to both Parties upon a joint determination that safeguards may be effectively applied.
Title to produced nuclear fuel materials
Title to nuclear fuel materials produced by irradiation of U.S.-supplied fuel materials shall be for the account of the lessee and title to it shall be in the lessee unless ERDA and the lessee otherwise agree.
Transfer of U.S. supplied items
An agreement nation may not transfer U.S. supplied materials, including equipment and devices, beyond its jurisdiction except as ERDA may agree and then only if in the opinion of ERDA the transfer is within the scope of an agreement for cooperation between the United States and the other nation or group of nations.
U.S. safeguards rights
The United States has the right to review the design of any reactor and other equipment and devices the design of which ERDA determines to be relevant to the effective application of safeguards. The United States has the right to require the deposit in storage facilities designated by ERDA of any U.S.-supplied special nuclear material not in current use for civil purposes. U.S. safeguards rights apply to any source or special nuclear materials used in, recovered from, or produced as a result of the use of, among other things, any other equipment or devices designated by the ERDA.

and the Department of State established a durable framework of agreements for nuclear cooperation with many nations and internationl organizations. The agreements enabled the Commission, its contractors, companies in the U.S. nuclear industry and individuals to deal directly with government organizations and other parties in the agreement nations. The agreements carried a great outward flowing surge of U.S. nuclear science and technology into the world. Initially the agreements enabled other nations to quickly learn the progress of U.S. development of civil nuclear power through visits, meetings, conferences, training and some use of U.S. nuclear facilities, plus a development and demonstration program with Euratom. Now the web of agreements provides the U.S. nuclear industry with access to the free world nuclear market where it can compete for sales of nuclear power plants, nuclear steam supply systems and parts thereof, and nuclear fuels--primarily enriched uranium from the factories of the Energy Research and Development Administration. In the future, the U.S. nuclear industry may offer fuel reprocessing services.

It is reasonable to conclude that through the agreements for cooperation and the export licenses, the United States has contributed to the growth abroad of a nuclear industrial base in many countries, although this base appears limited mainly to manufacture of nuclear power reactors and associated parts and fabricated fuel. The transfers of nuclear technologies, materials and equipment worked towards the goals of Atoms for Peace and probably provided the United States with more than a decade of influence over foreign development of nuclear power. Unfortunately, the success of

the agreements has served to diminish this source of influence as nations abroad have found other supplier nations, or have developed their own nuclear capabilities.

Changing times and goals

The agreements for cooperation authorized by the revision of the Atomic Energy Act in 1954 reflect the circumstances of the mid 1950s. Now, 20 years later, the agreements are little changed but the circumstances are markedly different. Twenty years hence it is reasonable to expect that circumstances will be different still. So at this point in time it is appropriate for Congress to consider both what was expected of the agreements in 1955 and what can and should be expected of them in 1975 and for the future.

The situation 20 years ago.--Twenty years ago the architects of U.S. nuclear cooperation began their conceptual design of the present framework of cooperative agreements. At that time expanding cooperation in peaceful uses of atomic energy offered attractive prospects for reducing some of the tensions of the cold war. There was even hope, stillborn though it proved to be, that this cooperation could divert nuclear materials from weapons to civil purposes.

In the mid 1950s the proliferation problem was the vertical one of ever-expanding nuclear arsenals of the United States and the Soviet Union. While it was recognized that fostering peaceful uses of atomic energy and nuclear power ultimately might provide more nations with the means to make their own nuclear weapons, the realization was more academic than real. The

United States then dominated world nuclear technology except for the British drive toward use of normal uranium as fuel, and the United States enjoyed a virtual monopoly on the supply of enriched uranium and enrichment services to the free world. The safeguards rights and commitments in the U.S. agreements for cooperation were designed to keep the risks of undetected diversion or theft of nuclear materials within acceptable bounds, and laid the way for substantial exercise of safeguards functions by the International Atomic Energy Agency.

The situation today.--The outset of 1976 sees six nations that have detonated nuclear weapons or devices and many more that probably could do so quickly if they so chose. Now the principal bar to further proliferation is no longer the inability to make the materials for weapons and to design and fabricate weapons. Rather, it is the judgment by individual nations that their production of nuclear weapons is not necessary for their defense or welfare and that the benefits of proliferation would be outweighed by the costs, efforts and possible world reaction. It is evident that a nation with an industrial capacity can, if it wishes, produce nuclear weapons materials and weapons without having to steal or divert materials from today's nuclear powerplants. Possession of facilities to reprocess spent fuel and to fabricate plutonium will markedly increase their nuclear industrial base.

Another major change of the past two decades has been the emergence of terrorism as a way for subnational groups to attempt to impose their will upon others. The increasing frequency and severity of terrorist actions in some countries has caused some concern that terrorists might

attempt to steal nuclear materials to make and use crude weapons, or to release plutonium as a radiological weapon, or to so sabotage nuclear facilities as to cause dangerous releases of radioactive materials. The concern over terrorism has generated pressure for measures to increase physical security of nuclear materials and installations as well as the security of vital energy, communications and transportation facilities.

The changes of the past two decades have changed the character of nuclear cooperation and the prospects for proliferation. Now cooperation appears to be shaped more by a desire to assure national nuclear industries a growing share of the world nuclear market and so is moving more toward commercial relationships and away from the open exchange among scientists contemplated by agreements in 1955. Likewise the concern over proliferation has changed from dealing with the escalating vertical proliferation of weapons production by the United States and the Soviet Union to preventing, or limiting, or delaying further horizontal proliferation of the manufacture of nuclear weapons among nations of the world. In 1955 nuclear power was seen as an alternative energy source for the future, but the United States was still an exporter of fuels and had little current need for nuclear power. In 1975, two years after the oil embargo, many nations, including the United States, now look to nuclear power as a way to relieve their dependence upon scarce oil the price of which is determined abroad by political rather than economic criteria.

In terms of negotiation and administration of agreements and related actions, twenty years ago the U.S. Atomic Energy Commission largely do-

minated the scene. Now two agencies are actively involved with negotiation of agreements, one with administration of the agreements, and two more with action on applications for licenses to export nuclear materials and equipment. The respective roles of these agencies still is changing as the long-term effects of the Energy Reorganization Act of 1974 begin to emerge.

Today the Department of State appears to have the lead responsibility for negotiation of agreements and seems to be exercising this responsibility.* The Energy Research and Development Administration remains an active participant in negotiation and administration, backed by the strong intellectual and physical resources of its national laboratories. As noted elsewhere, its influence as a world supplier of uranium enrichment services has been reduced with the booking up of its enrichment plants and the probable wait of five years or more before the U.S. enrichment capacity can be substantially increased by public or private investment. The Nuclear Regulatory Commission is taking seriously its responsibilities for licensing the exports of nuclear materials and nuclear power reactors and their major parts. The Commission believes it has a de facto statutory veto power in those instances where it finds that the proposed export is inimical to the common defense and security and the public health and safety. The potential for divergent or contradictory action by the Administration and the Commission is real, although it is not clear whether the Administration itself could make an export to circumvent a denied license.

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* During the regime of the U.S. Atomic Energy Commission, its chairman acted as U.S. spokesman for nuclear matters, particularly during the long chairmanship of Dr. Glenn T. Seaborg who was chairman from 1960 to 1971.

The situation 20 years hence.--What Congress may expect of agreements for cooperation in the years ahead depends upon what the most likely future appears to be and what is desired from U.S. policy and decisions. Assuming no major war or other events disruptive of society, it seems prudent to expect that because of dwindling world supplies of oil and natural gas, many nations will turn more to nuclear power and many national nuclear power industries will be expanded and diversified. Some plutonium probably will be used for nuclear fuel and the first generation of commercial breeder reactors will probably be in use. There will be facilities for reprocessing used fuels to recover plutonium. The amounts of plutonium in storage, in fuel fabrication plants and in transit will increase substantially. Some highly enriched uranium also may be present in the civil nuclear fuel cycle. All of these anticipated developments point to an increased probability that more nations will be able to make nuclear weapons if they choose to do so, and that subnational groups will have more places from which to try to steal fissionable materials.

What is not evident is whether new facilities to produce nuclear fuels--enrichment plants and fuel reprocessing plants--will be many, small and scattered among many nations, or whether they will be larger and fewer, perhaps one large plant per region; and whether such facilties will be national enterprises or will be owned and operated by international or regional organizations.

This projection of the future could be substantially changed should nuclear weapons be used by non-weapons countries or by terrorist or other groups. What effects such an event would have are too conjectural to estimate here.

Future expectations of agreements for cooperation

What can be expected from agreements for cooperation in the fourth decade of the nuclear age?

First, the framework of agreements for cooperation can be expected to continue and to provide the basis for future U.S. commercial nuclear exports, assuming that efforts by some interests in the United States to bring about a nuclear moratorium do not prevail.

Second, the agreements for cooperation can be revised to provide more incentives for nations that have not ratified the Non Proliferation Treaty to do so, or at least to place all of their nuclear activities under international safeguards.

Third, the agreements for cooperation can be administered to assure a demand for international or regional fuel reprocessing.

Fourth, the agreements for cooperation can be revised to require safeguarding of technology as well as material transfers, and to require declaration and safeguarding of facilities made by the agreement nation with personnel trained in and technology obtained from the United States.

Fifth, the agreements for cooperation can emphasize the importance of physical security for nuclear materials and facilities and require the meeting of specified minimum standards.

In summation, the agreements for cooperation can be used as one means, although not the only means, to reduce the desire of agreement nations to make nuclear weapons; to assure the world community that U.S. nuclear cooperation will not be so used; and to foster nuclear interdependence rather than nuclear independence of nations.

APPENDIX I

to

ANALYSIS OF AGREEMENTS

by

Barbara Rather, Reference Assistant

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APPENDIX I. ANALYSIS OF AGREEMENTS

Over the past twenty years, the United States Government has entered into bilateral agreements for cooperation in civil uses of atomic energy with twenty-nine nations and two international organizations.* Of these agreements, twenty are for cooperation in research and power, eight for cooperation in nuclear power.

Another way of looking at these agreements is to sort them into categories and then see what are the similarities and differences between agreements in each category. The agreements fall nicely into four convenient categories: bilateral agreements for research and power, for research only, for power only, and agreements with international organizations. Providing this description and comparison is the purpose of what follows.

On the whole, within each category of agreements, the structure of individual agreements is quite similar. Each agreement consists of about a dozen articles which set out in general terms the boundaries and conditions of the cooperation. There are, however, differences among agreements which presumably represent the outcome of individual negotiations.

Agreements for Research and Power

The United States has entered into Agreements for Cooperation in the Civil Uses of Atomic Energy for Research and Power with the twenty nations listed in Table II. A brief comparative summary of principal provision for research and power agreements appears in Table IV. Note that the agreements with Canada and with the United Kingdom are treated se-

*Under authority and conditions of section 123 of the Atomic Energy Act of 1954 as amended.

parately because of their status as wartime partners of the United States in development of the atomic bomb and their strong postwar nuclear programs.

The principal articles of the research and power agreements are shown in Table I together with indications of their similarities and differences for 18 agreements.

Definitions

All of the bilaterals contain a section of definitions. These include definitions for: parties, atomic weapons, byproduct material, equipment and devices, person, reactor, restricted data, safeguards, source material, and special nuclear material. Of special interest are the definitions for "atomic weapon", "safeguards", "restricted data", and "special nuclear materials." All of the bilaterals use the following definition for atomic weapon: "Atomic weapon means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device (where such means is a separable and divisible part of the device), the principle purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device. All of the bilaterals, except for Australia, Italy, South Africa, and Venezuela, contain the following definition of safeguards: Safeguards means a system of controls designed to assure that any materials, equipment and devices committed to the peaceful uses of atomic energy are not used to further any military purpose. Restricted data means "all data concerning (a) design, manufacture, or utilization of atomic weapons, (b) the production of special nuclear material, or (c) the use of special nuclear material in the production of energy". The definition does not include data which has been removed from the restricted category by declassifica-

tion. Special nuclear materials mean (1) plutonium, uranium enriched in the isotype 233 or in the isotope 235, and any other material which the United States or the other party determines to be special nuclear material, or (2) any material artifically enriched by any of the foregoing. This definition is essentially that of the Atomic Energy Act of 1954* with the added feature that the other party to the agreement may also define special nuclear materials.

The absence of a definition of safeguards in the agreements with Australia, Italy, South Africa and Venezuela is hard to understand. It appears also that all of the agreements would be improved by adding definitions of peaceful uses of nuclear energy, and for nuclear explosive devices.

Commmunication of restricted data

Although the agreements provide for exchange of nuclear materials and equipment, all of them specify that restricted data shall not be communicated. This limitation in essence limits the exchange of unclassified or declassified information. This distinction can be important for some new developments in nuclear power, such as laser separation of isotopes, probably would be considered as "born classified" by the United States and thus not available for transfer under agreements as written.

Scope of agreements

All of the agreements contain a specification of the fields in which information, other than restricted data, may be exchanged. These fields include:

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*The Atomic Energy Act of 1954 as amended, section 11(aa).

(1) Development, design, construction, operation, and use of research, materials testing, experimental, demonstration power, and power reactors and reactor experiments;

(2) The use of radioactive isotopes and source material, special nuclear material, and byproduct material in physical and biological research, medicine, agriculture, and industry; and

(3) Health and safety considerations related to the foregoing.

The Agreement with South Africa also provides that unclassified information on geology, exploration techniques, chemistry and technology of extracting uranium and thorium from their ores and concentrates, purification and fabrication of uranium and thorium compounds and metals, including design, construction, and operation of plants will be exchanged.

The information exchange is to be accomplished by various means including reports, conferences, and visits to facilities.

In the 13 agreements with Argentina, Austria, Brazil, China, Finland, Japan, Korea, Norway, the Philippines, Portugal, Spain, Sweden, and Thailand, a companion article specifies mateials which may be transferred between the parties for defined purposes when they are not available commercially. These materials include source material, heavy water, byproduct material, other radioisotopes, stable isotopes, and special nuclear material for purposes other than fueling reactors and reactor experiments. These agreements also state that specialized research facilities may be made available for mutual use consistent with limits of space, facilities, and personnel.

Equipment and devices related to the subjects of agreed information exchange may be transferred from one party to another under agreed terms

and conditions, subject to limitations arising from shortages or other limitations.

The agreements with Australia, Italy, and South Africa do not, however, provide for the transfer of equipment and devices.

U.S. supply of enriched uranium and other special nuclear material

The research and power agreements all commit the United States to provide enriched uranium or enrichment services and, in some cases, other special nuclear materials. Some agreements commit the United States to supply normal uranium if this is not available to the other nation for enrichment.

Transfers of enriched uranium are to be under agreed upon terms and conditions and the transferred materials are limited to research and power use. Suitable research uses mentioned in agreements include reactor experiments, and reactors for research, materials testing, experimental, scientific and industrial uses. The uranium supplied may be enriched up to twenty percent. However part of the uranium may be enriched to more than 20 percent if ERDA determines there is a technical or economic justification. The amount of enriched uranium transferred may not exceed that necessary to fuel the reactors or reactor experiments involved plus an additional quatity that is determined by the parties to be necessary for the efficient and continuous operation. Upon the request of a recipient nation, ERDA may sell enriched uranium to a recipient nation under agreed terms and conditions. When the recipient nation is ready to contract for enrichment services, the United States assures it of equitable access with other purchasers to available U.S. capacity which has not already been allocated.

The preceding provisions appear in the agreements with Austria, China, Japan, Korea, Portugal, South Africa, Sweden, Switzerland and Thailand. The agreements with Argentina, Australia, Brazil, Finland, Italy, Norway and the Philippines in addition commit the United States to supply normal uranium for enrichment upon terms and conditions to be agreed, including fuel for maritime appreciations in Argentina.

The agreement with Norway additionally provides for ERDA to transfer up to 10 kilograms of enriched uranium-233 under terms and conditions to be agreed to in advance. For Italy, the United States, through ERDA, may make available up to 8 kilograms of 90 percent enriched uranium for use in research reactors, materials testing reactors, and reactor experiments. Also the Italian agreement permits that government to allow its authorized users to acquire title to uranium that it has purchased from the United States.

The agreements with Brazil and Argentina provide that plutonium may be transferred to either government or its agents for use as fuel in reactors and reactor experiments under terms and conditions to be agreed upon in advance of each transfer. In addition, the Brazilian agreement allows the United States to transfer responsibility for supplying special nuclear material or enrichment services to private enterprise under U.S. jurisdiction.

Under the agreement with Venezuela, ERDA will transfer, as may be agreed, enriched uranium for use in defined applications, including research, experimental power, demonstration and power reactors which the Government of Venezuela decides to construct or operate, or authorizes private persons to do so. Terms and conditions and delivery schedules for each transfer are to be agreed upon in advance.

Amounts of materials and separative work

The agreements with Austria, China, Japan, Korea, Portugal, South Africa, Spain, Sweden and Switzerland limit the amount of separative work to be performed by the United States to the amount needed to support the fuel cycle of a specific installed reactor capacity, (designated in each Agreement).

The six agreements with Argentina, Australia, Brazil, Finland, Norway, and the Philippines contain a formula that limits the amount of enriched uranium to be transferred under the agreements. The aggregate of the net quantity of U-235 enriched uranium transferable under the agreements may not exceed on amount designated in each agreement. Within that ceiling, transfers may be made using the following method of calculation.

> From the quantity of U-235 contained in enriched uranium transferred the quantity of U-235 contained in an equal quantity of uranium of normal isotopic assay is subtracted. From this amount the following quantity is subtracted:
>
> > The aggregate of the quantities of U-235 contained in recoverable uranium originally either returned to the U.S. or transferred to another approved nation, minus the quantity of uranium of normal isotopic assay.

The Italian agreement provides that the net amount of enriched uranium sold or leased may not exceed 7,000 kg. of contained U-235.

The agreement with Venezuela states that the net amount of U-235 in enriched uranium transferred during the period of the agreement shall not at any time exceed 25 kilograms. This net amount shall be the gross quantity of contained U-235 in uranium transferred less the quantity of contained U-235 in recoverable uranium which has been resold or otherwise

returned to the U.S. or transferred to any other approved nation, or group of nations.

The agreements with Argentina, Brazil and Japan also limit the quantity of plutonium that may be transferred. The net amount transferable to Argentina and Brazil may not exceed 20 kilograms. The net amount transferable to Japan may not exceed 365 kg. The net amount transferable is the gross quantity transferred minus the quantity which has been returned to the U.S. or transferred to another approved nation or group of nations.

Reprocessing, conversion, and fabrication

The agreements with Austria, China, Korea, Portuga, South Africa, Spain, Sweden, Thailand and Venezuela provide that when the SNM received under an agreement requires reprocessing, or when the irradiated fuel elements containing fuel material received from the United States need to be removed from a reactor or altered in form or content, the reprocessing or alteration shall be performed in facilities acceptable to both Parties under a joint determination that safeguards will be effectively applied. Special nuclear material produced by irradiatation of leased fuel is to be credited to the lessee and after reprocessing, title to this material is with the lessee unless ERDA and the lessee agree otherwise.

The agreement with Spain specified that irradiated SNM of U.S. origin may be transferred from third countries to Spain for chemical reprocessing and subsequent applications in Spain or other nations. These transfers are under terms and conditions that are to be agreed to.

The agreement with Japan provides that either Party is authorized to receive material for the performance of conversion and/or fabrication services under agreed terms and conditions. The processed material is then to be returned to the territory of the nation from which it was transferred or transferred to another nation or international organization in accordance with the provisions of the agreement.

Special nuclear material may be transferred to Sweden or its authorized persons for performance of conversion and/or fabrication services and for subsequent transfer to another nation or group of nations under terms and conditions to be agreed upon.

The agreements with Argentina, Brazil, Finland and Japan provide that reprocessing or alteration of form or content may be performed in the recipient nation upon a joint determination by the Parties that the safeguards provisions in the agreement will be effectively applied. Reprocessing may also be performed in mutually agreed facilities.

Under the agreement with Finland, special nuclear material may also be transferred to Finland for conversion and/or fabrication services and then transferred to a third party. This transfer is subject to conditions that are agreed to for each transfer and other guarantees pertaining to transfer of title to enriched uranium by ERDA, that agency has the option of limiting the arrangements to undertakings described in the agreement.

Concerning reprocessing, the agreements with Australia, Italy, Norway and the Philippines require that reprocessing be performed at the discretion of ERDA in either ERDA facilities or those acceptable to the United States, on terms and conditions to be agreed upon. Unless otherwise agreed, the form and content of irradiated fuel elements is not to be altered after

their removal from the reactor and prior to delivery at the reprocessing facilities.

Norway, under terms and conditions agreed to for each transfer, may receive special nuclear material for the performance of conversion and/or fabrication services for subsequent transfer to a nation or group of nations with which the United States has an applicable agreement for cooperation. The United States, in event of the transfer of title of enriched uranium to Norway, has the option of limiting the arrangements to undertakings described in the agreement.

Disposition of SNM produced from U.S. supplied materials

All the agreements place restrictions on the transfer of materials produced through the use of material supplied by the United States.

In the agreements with Austria, Japan, Korea, Portugal, South Africa, Sweden, and Thailand, no special nuclear material produced through the use of transferred material may be transferred to another nation or group of nations unless the recipient has an agreement for cooperation with the United States Government or guarantees the use of such SNM for peaceful purposes under safeguards acceptable to the parties.

The agreements with Argentina, Brazil, China, Finland, Spain, Switzerland, and Venezuela state that no SNM produced through the use of transferred material may be transferred to any other nation or group of nations, except as ERDA may agree.

The agreements with Australia, Italy, Norway, and the Philippines have similar provisions. With respect to any SNM not owned by the United States which is produced in reactors fueled with materials obtained from the United States by means other than lease which is in excess of the needs

of the recipient nation's program for peaceful uses of atomic energy the United States has the following rights:

--a first option to purchase this material at prevailing U.S. prices,

--the right to approve the transfer of such material to any other nation or group of nations if the U.S. option to purchase is not exercised.

Safeguards

All of the agreements contain many provisions relating to safeguards as follows:

Civil use only. -- The agreement emphasize common interest in assuring that any material, equipment or devices made available to the recipient nations be used solely for civil purposes.

Safeguards. -- The United States is to have the following rights, except to the extent that the safeguards rights in the agreement are suspended by application of IAEA safeguards:

(a). to review the design of any reactor and other equipment and devices which ERDA determines to be relevant to the effective application of safeguards in order to assure that design and operation are for civil purposes and to permit the effective application of safeguards.

(b). to require the maintenance and production of operating records, and to request and receive reports for the purpose of assisting in ensuring accountability for materials supplied.

(c). to require that materials in the custody of the recipient nation are subject to all safeguards and guarantees in the agreement.

(d). to require the deposit in storage facilities designated by ERDA of any special nuclear material which is not currently utilized for civil power in the recipient nation, or transferred pursuant to the agreement, or disposed of pursuant to an arrangement mutually acceptable to both parties.

(e). to designate, after consultation with the recipient, personnel who shall have access in the recipient nation "to all places and data necessary to account for the source and special nuclear materials to determine whether there is compliance with the agreement" and to make the necessary independent measurements. If either party so requests, the personnel so designated may be accompanied by personnel designated by the recipient nation.

(f). to suspend or terminate the agreement and to require the return of any material, equipment and devices supplied in the event of non-compliance with the guarantees and the failure of the recipient nation to carry out the provisions of this article within a reasonable time.

(g). to consult with the recipient nation in matters of health and safety.

The agreements with Argentina, Brazil, China, and Japan include a U.S. commitment to direct persons designated by it to have access to the items in the recipient country not to reveal any industrial secrets, or confidential information to other than persons in the U.S. Government authorized to receive such information.

The agreements with Portugal, South Africa, and Spain each include a note on nuclear explosive devices. The notes state the "long held U.S. understanding" that no material, subject to the agreement for cooperation

will be used for any nuclear explosive device, regardless of how the device is intended to be used.

IAEA safeguards

The agreements with Argentina, Austria, Brazil, China, Japan, Korea, Portugal, South Africa, Spain, Sweden, and Thailand provide similar requirements for the application of IAEA safeguards. The parties noted that under previous trilateral agreements the IAEA had been applying safeguards to materials, equipment and facilities transferred to the jurisdiction of the recipient nation. The Parties, recognizing the desirability of continuing to make use of the facilities and services of the International Atomic Energy Agency, agreed that IAEA safeguards should continue to apply to the items transferred under current or superseded agreements.

The IAEA provisions in agreements with Australia, Philippines, Thailand, and Venezuela are short. The Parties note that they have been applying IAEA safeguards to materials, equipment and facilities transferred to the recipient nation, and agree that IAEA safeguards should continue to apply to those items transferred under the agreement.

At the time the agreements with Finland, Norway, and Switzerland were made, none of these nations had not trilateral agreements with the United States and the IAEA. As a result, these agreements provided for the parties to promptly request the IAEA to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the agreements. The agreements contemplated that the necessary arrangements would be effected without modification through another trilateral agreement to be negotiated between the Parties and the IAEA.

The agreement with Finland provides that should Finland enter into an agreement with the IAEA before a trilateral agreement was agreed to and the IAEA's safeguards were applied to Finnish nuclear activities, the United States would consult with Finland and the IAEA as to the extent that the provisions of the agreement between Finland and the IAEA would satisfy U.S. safeguards requirements. If the parties did not reach agreement on a trilateral agreement, either party by notification could terminate the agreement between Finland and the United States.

The agreement, between Italy and the United States affirmed a common interest in the establishment of an international atomic energy agency to foster the peaceful uses of atomic energy. If such an agency was created the parties agreed to:

--Consult with each other to determine ways to modify the agreement. In particular, the Parties agreed to consult with each other to determine in what respects and to what extent they desired to arrange for the administration by the international agency of those conditions, controls, and safeguards required by the international agency in connection with similar assistance rendered to a cooperating nation under the aegis of the international agency.

--In the event the Parties did not reach a mutually satisfactory agreement following the consultation provided for in the above, either Party by notification could terminate the agreement. If it was terminated, the Italian Republic would return to the U.S. all source and special nuclear materials received pursuant to this agreement and its possession or in the possession of persons under its jurisdiction.

Termination of IAEA safeguards

The agreements with Argentina, Austria, Brazil, Finland, Japan, Norway, Spain, and Switzerland contain similar provisions for termination of IAEA safeguards. If an IAEA safeguards agreement should be terminated prior to the expiration of an agreement and the parties failed to agree promptly (within three months in the Brazilian Agreement) upon a resumption of IAEA safeguards, either Party could, by notification, terminate the Agreement ("upon adequate notice and with an accompanying statement of reason" in the Agreement with Argentina). Before either Party acts to terminate an agreement they are committed to carefully consider the economic effects of such termination. Neither Party is to invoke termination until the other Party has been given sufficient advance notice to permit arrangements by the recipient nation for an alternative source of power and to permit adjustment by the United States of production schedules. In the event of termination by either Party, the recipient nation is to return to the United States all special nuclear material received and still in its possession or in the possession of persons under its jurisdiction. The U.S. Government is to compensate the recipient Government or the persons under its jurisdiction for their interest in the returned material.

The agreements with Australia, China, Korea, Philippines, South Africa, Sweden, Thailand, and Venezuela provide a variation. If a trilateral safeguards agreement is terminated prior to the expiration of an agreement and the Parties fail to promptly agree to a resumption of IAEA safeguards, either Party may, by notification, terminate the agreement. In the event of termination by either party, the recipient government shall,

at the request of the United States, return to the United States all special nuclear material received pursuant to the agreement and still in its possession or in the possession of persons under its jurisdiction. The United States is to compensate the other nation or persons under its jurisdiction for their interest in the returned materials. Under the agreement with Sweden, the U.S. Government will carefully consider the economic effects of any termination action and provide sufficient advance notice to permit arrangements by the Swedish Government for an alternative source of power.

Conditions for transfers of equipment and devices

All of the agreements specify conditions for the transfer of equipment and devices between the two parties.

The 15 agreements with Argentina, Australia, Austria, Brazil, China, Finland, Japan, Korea, Norway, the Philippines, Portugal, Spain, Sweden, Thailand and Venezuela state that arrangements may be made between the parties, or authorized persons under their jurisdiction, for the transfer of equipment and devices, materials other than Special Nuclear Materials (SNM) and for the performance of services related to these items. The transfers are subject to the type of exchange, the amounts and other conditions and limitations prescribed in the agreement.

Arrangements may be made between eithe Party or its authorized persons for the transfer of special nuclear material and for the performance of services with respect thereto, under the provisions of the Agreement. This provision in the Agreement with Astria is slightly diferent. SNM or related services may be transferred for uses specified in the Agreement, provided that arrangements involving persons under the jurisdiction of the Republic of Austria will not be undertaken until the U.S. Government is

notified by Austria that these pesons may undertake the necessary arrangements.

The agreement with Italy states that private individuals and organizations in either nation may deal directly with private entities in the other nation. Arrangements for the transfer or export of materials, equipment and evices, and for performance of services related thereto is subject to the limitations of this agreement, and the laws, regulations, and license requirements of the Parties.

Responsibility for information and materials

All of the agreements disclaim any responsibility for the accuracy and completeness of the information exhchanged. Additionally, the transferred material, equipment, and devices transferred are not warranted.

Responsibility for safe handling of materials

All of the agreements provide that after delivery of materials, the recipient nation is responsible for their safe handling and use. When special nuclear material or fuel elements are leased by the United States, the recipient nation indemnifies and holds harmless the United States against any and all liability, including third party liability, for any cause arising out of the production, fabrication, ownership, lease possession and use of the materials after delivery.

Guarantees

All of the agreements contain identical guarantees by the recipient nations, which include:

--Maintenance of safeguards

--No transferred material, equipment, devices or special nuclear

materials to be used for atomic weapons, or for research on or development of atomic weapons, or any other military purpose.

--No transfer of supplied material, including equipment and devices, except as the ERDA may agree and then only if, in the opinion of ERDA, the transfer of the material is within the scope of the agreement.

In many agreements the United States makes similar commitments concerning material, including equipment and devices, transferred to it or authorized persons under its jurisdiction, by purchase or otherwise, and no special nuclear material produced through the use of such material, including equipment or devices, is to be used for atomic weapons or for research on or development of atomic weapons or for any other military purpose. However there is a substitution clause under which an equivalent amount of material of the same type as transferred or produced may be substituted by the United States. The United States is also committed in many agreements not to transfer material, including equipment and devices, transferred to it, or persons under its jurisdiction, except as the other party may agree. These commitments are made in the agreements with Argentina, Australia, Bazil, Finland and Japan. In the agreements with Switzerland and Sweden, the U.S. guarantee is limited to equipment and devices transferred and not to special nuclear materials.

The Research and Power Agreements with the United Kingdom and Canada

The agreements with Canada and the United Kingdom for cooperation in nuclear research and power differed substantially in format and detail of content from other agreements. In retrospect, this probably reflected the

comparatively strong positions of both countries in nuclear technology in 1955, and a carryover of the wartime partnership of these nations with the United States.

Definitions

Both agreements define atomic weapon by product material, classified, equipment and devices, person, pilot plant, reactor, restructed data, special nuclear materials. The Canadian agreement also includes definitions of production facilities, utilization facilities and source materials from the Atomic Energy Act of 1954.

An atomic weapon is defined in the U.K. agreement to mean any device utilizing atomic energy, exclusive of the means for transporting or propelling the device, the principal purpose of which is for use as or for development of, a weapon, a weapon prototype, or a weapon test device, the Canadian agreement refers to the definition in the Atomic Energy Act of 1954.

Both agreements define classified to mean a security designation of "Confidential" or higher applied under the laws and regulations of either party to any data, information, materials, services or any other matter, and includes restricted data.

Scope of agreements

The Canadian agreement contains no statement of scope. However, in its preamble the parties agree to assist each other in the achievement of the objectives of their respective atomic energy programs to the extent such assistance is relevant to current or projected programs and subject to applicable laws of the respective governments and the availability of material

and personnel. The agreement states an express understanding that the design, fabrication, disposition or utilization of atomic weapons are outside the scope of the agreement.

The United Kingdom agreement has a specific statement of scope which commits the parties to assist each other in the achievement of the use of atomic energy for peaceful purposes. The intent of the parties is that such assistance is to be rendered on a reciprocal basis. The disposition and utilization of atomic weapons and exchange of restricted data relating to the design or fabrication of atomic weapons is outside of the scope of the agreement.

Exchange of information

The agreements both give substantial attention to information not to be exchanged as well as that open for exchange. Classified and unclassified information is to be exchanged between ERDA and appropriate agencies of the Parties with respect to the application of atomic energy to peaceful uses, including research and development relating thereto, and problems of health and safety. The agreements specify fields in which classified information is to be accomplished through various means including reports, conferences, and visits to facilities.

Limitations on information to be exchanged

The agreements, provide for some exchange of classified information, but only that relevant to current or projected programs may be exchanged. The parties agreed not to exchange restricted data relating to de-

sign or fabrication of atomic weapons or to exchange restricted data primarily of military significance. As for restricted data relating to development of submarine, ship, aircraft or package power reactors, this is not to be exchanged. However the agreements specify that at such time as any one of these military type reactors warrants application to civil uses, restricted data on that type shall be exchanged as may be agreed.

The agreements also bar the exchange of restricted data on specific experimental power, demonstration power, or power reactors unless the reactor was currently in operation in the receiving country or was being considered seriously for construction by the receiving country. However there is to be exchanged such general information, including restricted data, on design and characteristics of various types of reactors as is required to permit evaluation, and comparison of their potential use in a nuclear power program.

Each agreement also exempts exchange of privately developed and privately owned information and information received from other Governments which the parties are not permitted to exchange. Finally, it is mutually understood and agreed that any limitations to cooperation imposed under the agreement would be reciprocal.

Information to be exchanged

The Canadian agreement provides for exchange of information on reactors,* source materials,** materials,*** health and safety, instruments, instrumentation and devices. However, ERDA is not to communicate restricted data pertaining to design, construction and operation of production plants for uranium enrichment, or separation of other isotopes. In addition, ERDA was not to communicate restricted data on production plants for the separation of deuterium until Canada should determine that construction of such plants was required. As an alternative to exchange of information on these matters, ERDA is committed to supply Canada with enriched uranium and, until Canada built its own heavy water plant, was committed to supply heavy water.

The United Kingdom agreement is detailed in its specification of information for exchange concerning nuclear reactors which includes reactor

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*Information on reactors included that on development, design, construction, operation and use of research, production, experimental power, demonstration power, and power reactors except those with military significance.

**Source materials information included geology, exploration techniques, chemistry and technology of extracting uranium and thorium from their ores and concentrates, the chemistry, production, technology, and techniques of purification and fabrication of uranium and thorium compounds and metals, including design, construction and operation of plants.

***Materials information included:

(1) Physical, chemical and nuclear properties of all elements, compounds, alloys, mixtures, special nuclear materials, byproduct material, other radio isotopes, and stable isotopes and their behavior under various conditions.

(2) Technology of production and utilization included information from laboratory experimentation and theory of production up to pilot plant operations (but not including design and operation of pilot plants and full scale plants, except as may be agreed), of all elements, compounds, alloys, mixtures, special nuclear material, byproduct material, other radioisotopes, and stable isotopes.

physics, reactor engineering, properties of reactor materials, specification for reactor materials, reactor components and overall design and operational techniques and performance of research experimental power, demonstration power, and power reactors. However detailed design, detailed drawings and applied technology for such reactors and related components, equipment and devices is not to be exchanged except as may be agreed.

Classification policies

Both agreements provide for maintenance of mutually agreed classification policies with respect to all information, materials, equipment and devices exchanged. The Parties are committed to continue periodic consultation with each other on the classification of atomic energy information.

Materials and facilities for research

The Canadian and United Kingdom agreements both provide for exchange of materials and access to facilities for nuclear research. Materials of interest in connection with the subjects of information specified in the agreements are to be exchanged for research purposes in such quantities and under such terms and conditions as may be agreed. The agreements list materials including source materials, special nuclear materials, by-product material, other radioisotopes, and stable isotopes. As for specialized research facilities and reactor testing facilities, these are to be made available for mutual use upon such terms and conditions as may be agreed. The agreements note that such use must be consistent with limits of space, facilities and personnel conveniently available. The Canadian agreement commits ERDA not to permit access by Canadian personnel facilities which

in ERDA's opinion are primarily of military significance. The agreement with the United Kingdom specifies the understanding that neither Party will be able to permit access by personnel of the other Party to facilities which are of primarily military significance.

Military for power and other non-research uses

Both agreements contain detailed provisions for supply of special nuclear materials and other mateials for power and other non-research uses. The provisions are similar to those for other research and power agreements, but in more detail. The two agreements are also somewhat different.

The Canadian agreement commits ERDA to sell, lease, or loan to Canada, under such terms and conditions as may be agreed, such quantities of enriched uranium as may be required in the Canadian power reactor project program. The amounts are subject to any limitations of quantities available for distribution by ERDA and subject to the limitations that the quantity of enriched uranium of weapons quality transferred to Canada shall not, in the opinion of ERDA, be of military significance. It is agreed that the enriched uranium which ERDA will sell, lease or loan will be limited in enrichment to a maximum of 20 percent. However, ERDA may, upon request, and in its discretion, make part of the enriched uranium available at a higher enrichment when there is a technical or economic justification for such a transfer.

The Canadian agreement gives ERDA a first refusal of any special nuclear materials derived from U.S. supplied enrichment uranium which Canada may desire to transfer outside of that nation.

The United Kingdom agreement provides simply that specific arrangements may be made under which "...special nuclear material required for developmental purposes, including use in research and experimental reactors, may be exchanged for other materials under such terms conditions as may be agreed." It is notable in its provisions for British processing of U.S. supplied irradiated special nuclear materials, upon terms and conditions to be agreed upon. The recovered materials may be converted in chemical form or fabricated into nuclear fuel by the United Kingdom under terms and conditions to be agreed. Also in connection with conversion and fabrication services for nuclear fuels, the United States may agree as follows:

The Canadian agreement commits ERDA to sell to Canada such quantities of normal uranium, and to the extent practical in such form, as may be required for the power reactor program in Canada, and under such terms and conditions as may be agreed, subject to supply and the needs of the U.S. program.

The Canadian agreement commits ERDA to an understanding with Atomic Energy of Canada Ltd covering the sale of heavy water for use in two experimental reactors and provides for specific future arrangements for the lease or sale and purchase of non-research quantities of other materials under such terms and conditions as may be mutually agreed.

The United Kingdom agreement provided for specific arrangements, as may be agreed upon, for sale and purchase, under agreed terms and conditions, of materials other than special nuclear materials. As for the latter, the parties may make specific arrangements for exchange of special nuclear material for developmental purposes.

Amounts of materials and separative work

Neither agreement provides for or specifies limits for separative work. This omission is not surprising in that both countries have focused their civil nuclear power programs on use of natural uranium for fuel. The Canadian agreement has no specified ceiling for U.S. supply of enriched uranium while that for the United Kingdom specifies a limit of 2,400 kilograms of contained uranium-235.

Reprocessing, conversion and fabrication

Both agreements cover reprocessing of irradiated fuels and conversion and fabrication involving U.S. supplied materials.

The Canadian agreement implies reprocessing in its provision that Canada will give ERDA a first refusal of any special nuclear materials produced from the irradiation of U.S. supplied enriched uranium which the Government of Canada may desire to transfer outside of Canada. The United Kingdom agreement provides that irradiated special nuclear materials of U.S. origin may be transferred, under such terms and conditions as may be agreed, to the United Kingdom for chemical reprocessing.

As for conversion and fabrication services, the Canadian agreement permits ERDA to transfer to Canada * under such terms and conditions as may be agreed, special nuclear material for ". . . performance in Canada of conversion or fabrication services, or both . . ." and the subsequent return to the United States or transfer to another nation or group of nations with which the United States has an agreement for cooperation. The agreement with the United Kingdom specifies that under such terms and conditions as may be agreed, the United Kingdom also may convert or fabricate or both transferred materials. In connection with such conversion and fabrication services, the United States may agree,

(1) to transfer to the United Kingdom uranium including its compounds in such amounts and at such enrichment in the isotope U-235 as when blended with the reprocessed uranium will permit the fabrication of replacement fuel;

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*These materials may be transferred to the two Canadian crown corporations Atomic Energy of Canada Ltd. and Eldorado Mining and Refining Ltd.

(2) to transfer to the United Kingdom uranium including its compounds in such amounts and at such enrichment in the isotope U-235 as may be required for replacement fuel and to accept the reprocessed uranium as a credit against the transfer;

(3) to permit the blending of the reprocessed uranium with United Kingdom material; and

(4) to permit the re-enrichment of the reprocessed uranium in United Kingdom facilities.

Upon completion of any of these services, the material may be transferred to another nation or group of nations, or be retained in the United Kingdom for uses within the terms of the agreements. Also concerning conversion and fabrications services, the agreement provides for transfers, on terms and conditions as may be agreed, of special nuclear material for performance of these services in the recipient country.

Transfers of equipment and devices

Both agreements provide for transfer of equipment and devices, upon such terms and conditions as may be agreed, subject to a ban on transfers for military purposes. Each agreement recognizes that such transfers are subject to limitations which may arise from shortages of supplies or other circumstances.

Transfers and exports by private individuals and organizations

Both agreements establish a framework for private individuals and organizations to deal directly with their counterparts in the other country. The permitted transfers and exports include equipment and devices, and performance of services. The Canadian agreement excludes such transactions

that in ERDA's opinion are primarily of military significance, makes the transaction subject to laws, regulations and license requirements of both countries, and make the transactions subject to approval of the government ". . . to which the person is subject when the materials or service are classified or when the furnishing of such materials and services requires the communication of classified information."

The United Kingdom agreement includes fewer restrictions. It limits transfer and export arrangements between private individuals or organizations which involve any classified information. Transactions are permitted only when any classified information falls into any of three fields* and are subject to:

(1) a ban on transfers or exports "primarily of a military character."

(2) applicable laws, regulation and license requirements.

(3) "approval of the party to the jurisdiction of which the person making the arrangement is subject if the materials or services are classified or if the furnishing of such materials or services requires the communication of classified information."

Safeguards

Neither agreement contains provisions for safeguarding U.S. supplied nuclear materials comparable to those of other agreements for re-

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*The three fields are:

(1) the subjects of information exchange specified in the agreement.

(2) the development, design, construction, operation and use of research, experimental power, demonstration power, and power reactors.

(3) the development, design, manufacture and use of equipment and devices of use in connection with permissible fields for information exchange.

search and power. There are no U.S. inspection rights and no commitment for supplying information on materials quantities. However the guarantee provisions of each agreement commit the parties to safeguard classified transfers, where the word "safeguard" appears to mean physical protection rather than the meaning in other agreements.

IAEA safeguards

Neither agreement provides for the IAEA to apply safeguards.

Responsibility for information and materials

Both agreements contain the same provisions for responsibility for information and materials as appears in the other agreements for research and power.

Responsibility for safe handling of materials

Neither agreement contains the provision for safe handling of materials that appears in other agreements for research and power.

Guarantees

Both agreements provide guarantees by the parties to safeguard transferred classified material, equipment, devices and classified information; not to use transferred items for atomic weapons, or research and development of atomic weapons, or any other military use; and not to transfer items to unauthorized persons or beyond the jurisdiction of the receiving country.

The Canadian agreement ties the first guarantee to security safeguards and standards prescribed by the separate security arrangements between the AEC and the Atomic Energy Control Board of Canada. The United

Kingdom agreement states that this safeguarding is to be in accordance with applicable security arrangements between ERDA and the UK Atomic Energy Authority.

The transfer of U.S. supplied items by Canada or the United Kingdom to another country requires the written consent of ERDA. The agreements note that such consent will be given only if the transfer is within the scope of an agreement for cooperation between the United States and the other nation, or group of nations.

The Canadian agreement includes two separate specific guarantees by the United States. The first is for the United States to maintain security safeguards and standards for all Canadian supplied classified information and materials, including equipment and devices. The second commits the United States not to transfer items from Canada to unauthorized persons or beyond U.S. jurisdiction except as to the government of Canada may agree.

Agreements for Cooperation in Research

The United States has entered into Cooperative Agreements for Research for Civil Uses of Atomic Energy with Colombia, Greece, Indonesia, Iran, Ireland, Israel, Turkey and the Republic of Viet-Nam.* Many of the provisions of these Agreements are similar to the Research and Power Agreements discussed previously.

Definitions

All of the agreements include definitions for comission, equipment and devices, research reactor, restricted data, atomic weapon, and special

*The Vietnamese Agreement was suspended and is not discussed in this report.

nuclear material. In addition, the agreements with Indonesia, Ireland and Colombia include definitions for parties, byproduct material, and person. The agreements with Ireland and Indonesia also define safeguards. All definitions are identical to those in the research and power agreements.

Cooperation and Restricted Data

Concerning cooperation and Restricted Data, the Agreements with Ireland and Indonesia are identical. In them, the parties agree to cooperate in the achievement of the uses of atomic energy for peaceful purposes subject to the provisions of the Agreement, the availability of personnel and material, and the applicable laws, regulations, and license requirements in force in their respective countries. Restricted data and information that the parties are not permitted to communicate are outside the scope of this agreement.

The Agreements with Israel, Turkey, Iran, and Colombia state only that restricted data shall not be communicated under the Agreement.

The Agreement with Greece does not mention restricted data.

Scope

Under the agreements with Colombia, Indonesia, Ireland, and Turkey, the areas in which information will be exchanged are the same as the research areas in the research and power agreements.

The agreements with Greece, Iran, and Israel outline the following areas as suitable for cooperation:

-design, construction, and operation of research reactors and their use as research, development, and engineering tools and in medical therapy.

-health and safety problems related to the operation and use of research reactors.

-the use of radioactive isotopes in physical and biological research, medical therapy, agriculture, and industry.

U. S. supply of enriched uranium

The agreements with Colombia, Israel, and Turkey are almost identical with respect to the enriched uranium to be transferred. They provide that ERDA will sell or lease, as may be agreed, uranium enriched up to 20% except as otherwise provided. This U-235 will be provided for fueling defined research reactors, materials testing reactors and reactor experiments. The recipient nation or persons under its jurisdiction will consult with ERDA about building the reactors. The net amount of uranium sold or leased during the period of the agreement, shall not at any time exceed a specified amount which shall be the gross quantity of such contained U-235 in uranium sold or leased to the other Party during the period of the agreement less the quantity of such contained U-235 in recoverable uranium which has been resold or returned to the United States or transferred to another nation or group of nations with U. S. approval.

The amount of enriched U-235 transferred to the other Party by the United States may not exceed the quantity necessary for the full loading of each defined reactor project plus an additional quantity, which in the opinion of ERDA is necessary for the efficient and continuous operation of the reactors.

ERDA may upon request and in its discretion, make all or a portion of the foregoing special nuclear material available as uranium enriched to more than 20% when there is a technical or economic justification.

Under the agreements with Ireland and Indonesia ERDA may provide the Parties or persons under their jurisdiction with enriched uranium for use as fuel in research applications. Contracts setting forth the terms, conditions, and delivery schedule of each transfer are to be agreed upon in advance. The net amount of U-235 transferred is not at any time to exceed twenty-five kilograms for each nation. The net amount will be determined in the same fashion as for Colombia, and Israel, and is not to exceed the fuel loading plus some additional materials.

The enriched uranium may contain up to twenty percent U-235. All or a portion of this SNM may be made available as uranium enriched more than twenty percent when ERDA finds there is a technical or economic justification for such a transfer for use in research reactors, each capable of operating with a fuel load not to exceed eight kilograms of contained U-235.

The Agreements with Iran and Greece state that ERDA will transfer enriched uranium to the other party or its authorized persons for use in defined research applications. Contracts setting forth the terms, conditions, and delivery schedule will be agreed upon in advance. The quantity of uranium-235 shall not at any time exceed six kilograms of contained U-235 in enriched uranium plus such additional quantity as is necessary to permit the efficient operation of the reactors while replaced fuel elements are cooling or while fuel elements are in transit. The enriched uranium supply may contain up to twenty percent U-235. All or a portion of it may be made available as uranium enriched to more than 20% when ERDA finds there is a technical or economic justification for such a transfer for use in research reactors.

Reprocessing

All of the agreements provide that when the source or special nuclear material received from the United States requires reprocessing, it is to be performed at the discretion of ERDA either in ERDA facilities or facilities acceptable to ERDA on terms and conditions to be later agreed. Except as otherwise agreed, the form and content of any irradiated fuel is not to be altered after its removal from the reactor and prior to delivery to ERDA or the other accepted facilities.

Disposition of SNM produced by irradiation

Under the agreements with Colombia, Greece, Ireland, Israel, and Turkey, special nuclear material produced from the irradiation of fuel leased from the United States is for the account of the other Party. After reprocessing it, it is to be returned to the other Party at which time title will be transferred to that Government, unless the United States exercises its option to retain the material while crediting the other nation for so much of the material as is in excess of the need of the other nation for peaceful uses of atomic energy.

Concerning special nuclear material not subject to the above options but which is produced from reactors fueled with U.S. material and is in excess of the need of the other Party's peaceful atomic program, the United States has the first option to purchase such excess material at prevailing United States prices. The United States also has the right to transfer such material to any other nation or international organization in the event the purchase option is not exercised.

Under the Agreement with Indonesia and Iran, special nuclear material produced as a result of irradiation processes in fuel leased by ERDA is for the account of the lessee and, after reprocessing, is to be returned to the lessee at which time title to such material is transferred "unless the Commission and the lessee otherwise agree."

No special nuclear material produced through the use of material transferred to the Government of Iran or its authorized persons under the Agreement is to be transferred to any other nation or group of nations, except as ERDA may agree.

Materials of interest

The research agreements generally provide for the United States to supply special non-nuclear materials for construction and operation of research reactors. These provisions have decreased in importance since the negotiation of most of the research agreements for the initial flurry of construction of research reactors has passed and few new ones are being built. In addition, most of the materials required for continued operation of such reactors other than fuel are readily available in the world market. The provisions for supply of materials nonetheless have a residual value for those occasional requirements for unusual materials available from ERDA laboratories but not from commercial sources.

The Israel and Turkish Agreements provided for ERDA to sell or lease to the other Party, or its authorized persons, such reactor materials other than special nuclear material which were not obtainable on the commercial market and which were required in the construction and operation of research reactors. The sale or lease of these materials were on terms

as to be agreed. Materials of interest in connection with defined research projects relating to peaceful uses of atomic energy included source materials, special nuclear materials, by-product materials, other radioisotopes, and stable isotopes. There were to be sold or transferred to the other Party for research purposes other than fueling reactors and reactor experiments in such quantities and under such terms and conditions as might be agreed when they are not available commercially.

The Agreements with Iran, Colombia, and Greece have different provisions concerning materials of interest.

The Agreement with Iran provides that materials of interest in connection with defined research projects related to the peaceful uses of atomic energy , including source material, special nuclear material, byproduct material, other radioisotopes, and stable isotopes, will be exchanged for research purposes in such quantities and under such terms and conditions as may be agreed when such materials are not available commercially.

The Colombian agreement is similar to that with Iran except that it also provides for materials of interest to be transferred to persons under the jurisdiction of Columbia.

The Agreement with Greece states that ERDA will sell or lease required reactor materials other than SNM which are not available commercially, through appropriate means to the Government of Greece or authorized persons under its jurisdiction. The sale or lease of these materials will be on terms as may be agreed. These materials include source materials, special nuclear materials, byproduct material, other radioisotopes and stable isotopes. In no case may the SNM at any one time be in excess of 100 grams of contained U-235, 10 grams of U-233, 250 grams of plutonium

in the form of fabricated foils and sources, and 10 grams of plutonium in other forms.

The provisons for Ireland and Indonesia are the same as provided in the research and power agreements with Argentina, above.

Safeguards

The safeguards provisions in the research agreements with Ireland, Colombia, Iran, and Greece are the same as the safeguards provisions in the Agreements for Cooperation in Research and Power.

In the Agreement with Turkey, that government agrees to maintain:

-such safeguards as are necessary to assure that the enriched uranium leased from ERDA will be used solely for the purposes of the agreement and to assure the safekeeping of the material.

-such safeguards as are necessary to assure that all other reactor materials, including equipment and devices, purchased in the U.S. under the agreement by the Turkish Government or authorized persons under its jurisdiction, shall be used solely for the design, construction, and operation of research reactors which the Turkish Government decides to construct and operate, and for research connected with them, except as may be otherwise agreed.

-records relating to the power levels of operation and burnup of reactor fuels and to make annual reports on these subjects. If ERDA requests, the Turkish Republic will permit ERDA representative to observe from time to time the condition and use of any leased materials, and to observe the performance of the reactor in which the material is used.

IAEA Safeguards

The agreements with Iran and Indonesia note their trilateral Agreements with the IAEA for application of IAEA safeguards, to materials, equipment and facilities transferred to the recipient Nation. The Parties agree that Agency safeguards, as provided in the trilateral agreement, and as it may be amended or supplanted by a new trilateral, shall continue to apply to such materials, equipment and facilities transferred under this agreement. Safeguards rights accorded to the U.S. Government by the agreements are suspended during the time and to the extent that Agency safeguards apply.

In the agrement with Israel, Colombia, Greece and Ireland, the Parties recognize the desirability of making use of IAEA facilities and services and agree that prior to the transfer to the recipient of any materials or facilities subject to safeguards under this agreement, the Agency will be requested to assume responsibility for applying safeguards to such materials and facilities. The Parties contemplate that the necessary arrangement can be effected without modification of the agreements through an agreement to be negotiated among the Parties and the Agency which could include provisions for suspension of the safeguards rights accorded to the U.S. Government during the time and to the extent that the IAEA safeguards apply. In the event that the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement, either Party may, by notification, terminate the Agreement.

The agreement with Turkey states that the application of safeguards to materials and facilities subject to safeguards under this Agreement will be carried out in accordance with the multilateral safeguards transfer agree-

ment signed by Turkey, the U.S., and the IAEA as may be amended, or in accordance with a safeguards agreement between the Turkish Republic and the IAEA under Article III of the NPT. The safeguards rights accorded the U.S. Government under this Agreement we suspended during the time and to the extent that the United States agrees that the need to exercise such rights is satisfied by an IAEA safeguards agreement.

Termination of IAEA safeguards

All the agreements except the Turkish Agreement provide the same termination provisions. In the event that the trilateral should be terminated prior to the expiration of the Agreement and the Parties should fail to promptly agree upon a resumption of Agency safeguards, either Party may, by notification, terminate the agreement. In the event of termination by either Party, the recipient nation shall, at the request of the United States, return to it all special nuclear material received and still in the recipient's possession or the possession of persons under its jurisdiction. The United States will compensate the recipient nation or persons under its jurisdiction for their interest in such material at the ERDA schedule of prices then in effect. The Turkish Agreement has no termination provisions.

Guarantees

In all of the Research agreements, only the recipient nations make guarantees. The guarantees made by Ireland, Indonesia, Greece, and Iran are identical to the guarantees in the research and power agreements.

Israel, Colombia, and Turkey guarantee that the safeguards provided in the agreement will be maintained. Further they guarantee that no material, including equipment and devices, transferred to the authorized

persons, by lease, sale, or otherwise, will be used for atomic weapons or for research on or development of atomic weapons or for any other military purposes. Further, no such material, including equipment and devices, will be transferred to unauthorized persons or beyond their jurisdiction except as ERDA may agree. The transfer will be agreed to only if, in the opinion of ERDA, it falls within the scope of an agreement for cooperation between the U.S. and the other nation.

Disclaimer of liability

All of the agreements contain a section in which the U.S. disclaims liability for the use of material and other items which it supplies under this agreement.

Expiration of Agreement

The agreements with Colombia, Greece, Iran, Ireland, Israel and Turkey state that upon expiration of the agreement or any extension thereof the recipient nation will deliver all fuel elements containing reactor fuels and reactor materials leased by ERDA to a site in the United States designated by ERDA. The expense of the delivery will be borne by the recipient nation and made under "appropriate safeguards against radiation hazards."

The Agreement with Indonesia has no such provision.

Agreements for Power

The United States has negotiated only two agreements specifically for nuclear power: one with India, the other with the United Kingdom. The provisions of each are discussed separately because of the difference between

the nuclear status of these nations. India had high hopes that nuclear power would be an important source of energy for its industrialization and, at that time, did not possess nuclear explosives. The United Kingdom, on the other hand, had a well developed nuclear technology using gas cooled power reactors, fueled with normal uranium, that were not proving as attractive in the world market as the British had hoped, and so alternatives had to be considered. The United Kingdom had nuclear weapons well before it concluded the power agreement with the United States.

India

Information exchange - Unclassified information concerning the development design, construction, operation, and use of the Tarapur Atomic Power Station will be exchanged between the Parties. Research and development information on problems of health and safety relating to this Station will also be exchanged.

Transfers - During the period of the Agreement, the U.S. (ERDA) will sell enriched uranium to the Indian Government for use in the Tarapur Station. The Tarapur Station will be operated only on special nuclear material made available by the U.S. ERDA or special nuclear material produced therefrom. (This is the only Agreement for Cooperation containing this provision.) The enriched uranium will not contain more than twenty percent U-235 and will be made available in accordance with the terms, conditions, and delivery schedule set forth in a contract to be made between the Parties. The net amount of U-235 contained in the enriched uranium sold by the U.S. shall not exceed 14,500 kilograms. This amount has been agreed upon by the Parties based on estimated fueling requirement. This net

amount of U-235 shall be the gross quantity of U-235 contained in the enriched uranium sold to the Government of India minus the quantity of U-235 contained in recoverable uranium resold or returned to the U.S. or transferred to another other nation, group of nations, or international organization with U.S. approval. (If the construction of the Tarapur Station had not begun by June 30, 1965 the U.S. would not have been required, unless it agreed otherwise, to sell enriched uranium for fueling the Tarapur Station.) The quantity of enriched uranium sold by the United States and held by the Indian Government may not at any time be in excess of the quantity necessary for the full loading of the Station plus an additional amount for efficient and continuous operation of the Station. The Government of India will retain title to any enriched uranium purchased from the U.S. Commission.

Reprocessing. When the special nuclear material utilized in the Tarapur Station requires reprocessing, it may be performed in Indian facilities upon a joint determination of the Parties that the provisions of this Agreement may be effectively applied, or in other mutually agreed facilities. The form and content of the irradiated fuel elements removed from the reactors is not to be altered before delivery to the reprocessing facility. Concerning any special nuclear material produced in the Tarapur Station which is in excess of the needs of India's peaceful nuclear program, the U.S. shall have the first option to purchase this material at currently effective U.S. domestic prices. If this option is not exercised, the Indian Government, with the approval of the U.S. Government, may transfer the excess material to any other nation, group of nations, or international organization. The Indian Government will be responsible for the safe handling and use of the materials transferred.

Materials - Materials, other than source materials or special nuclear materials needed for fuel, which are required for the Station but which are not available commercially, will be transferred by the U.S. Government to the Indian Government on terms and conditions, and in amounts as may be mutually agreed.

Responsibility for Information - The Parties disclaim responsibility for the accuracy, completeness, and suitability of information, materials, equipment and devices transferred under the Agreement.

Supply by private sources - The U.S. will permit persons under its jurisdiction to transfer and export materials, equipment and devices, other than source or special nuclear materials to, and perform services for, the Indian Government. Persons under the jurisdiction of the Indian Government are authorized to receive these items, subject to applicable laws, etc. in both nations.

Safeguards - Both Parties emphasize their common interest in assuring that the items transferred for use in the Tarapur Station be used solely for peaceful purposes. The fact that the Tarapur Station will be operated only on special nuclear material furnished by the U.S. and special nuclear material produced therefrom was reiterated in this article.

Both Parties have reviewed the design of the Tarapur Station and may review any significant modifications to it. The Parties may also review the design of other facilities which will use, fabricate or process any special nuclear material made available pursuant to this Agreement or produced in the Tarapur Station. Such a review will not be required if the Indian Government places an agreed upon equivalent amount of the same type

of SNM, under the scope of this Agreement, under mutually acceptable measurement arrangements.

An agreed upon system of records and reports shall be established as described below.

A. With respect to records, information covering the following will be included:

1. receipts of all nuclear materials,
2. internal movements of all nuclear materials,
3. any removal of nuclear materials, including shipments, known losses, and unaccounted for quantities,
4. inventories of all nuclear materials on hand at the end of each accounting period, showing form, quantity, and location, and
5. reactor-operating data necessary for determining and reporting on the production and consumption of any nuclear materials and the use of the Tarapur Atomic Power Station.

B. With respect to reports, information covering the following will be included:

1. all receipts and removals of nuclear materials,
2. any production and consumption of nuclear materials,
3. any known losses and unaccounted-for nuclear materials,
4. all inventories of nuclear materials, and
5. the operation of the Tarapur Atomic Power Station, including unusual incidents; and significant modifications made or to be made in the plant or in the fueling program.

Routine reports covering this information are to be submitted to both nations monthly. Any losses of nuclear materials or unusual incidents will be reported as soon as the incident has been discovered. If any special nuclear material transferred or produced under this agreement is placed in any facilities in India, other than Tarapur, the safeguards and reporting system outlined in this Agreement will apply. In the event of unusual incidents, special reports may be requested, including amplifications and elucidations which each party considers relevant.

Surplus special nuclear material either transferred to Tarapur or produced in this reactor, will be stored at the Tarapur Station unless otherwise agreed.

There will be consultations and periodic exchanges of visits between the Parties to assure that the objectives set forth in this Agreement concerning transfers are being observed. Personnel designated by the United States in consultation with India and personnel designated by India shall have full access to the Tarapur Station and to conversion, fabrication and chemical processing facilities in India, when special nuclear material transferred to India for the Tarapur Station is located at such facilities, and at other relevant times. Personnel so designated will also be afforded access to other places, data, and persons for the accomplishment of those objectives. The designated personnel may make independent measurements as either Party considers necessary. The United States will keep such access to a minimum, consistent with the need for effective verification.

The Government of India obtained an unusual right to remove quantities of U. S. supplied SNM from the scope of the agreement and to substitute equivalent material. The agreement provides that:

Notwithstanding anything contained in this Agreement, the Government of India shall have the right, upon prior notice to the Government of the United States, to remove from the scope of this Agreement quantities of special nuclear material provided it has, pursuant to mutually acceptable measurement arrangements, placed agreed equivalent quantities of the same type of special nuclear material under the scope of this agreement.

Noncompliance - In the event of noncompliance with the safeguards or guarantees in this Agreement, and the subsequent failure of the Indian Government to fulfill the guarantees and safeguards within a reasonable time, the U.S. Government has the right to suspend or terminate this Agreement and to require the return of any special nuclear material equipment and devices transferred and safeguarded under this Agreement.

Guarantees - The Indian Government guarantees that no material, equipment or device transferred to it or its authorized persons will be used for atomic weapons, for research or development of atomic weapons, or for any other military purpose. Further, India guarantees that no material, equipment or device will be transferred to unauthorized persons or beyond its jurisidction except as the U.S. and India agree. If the Parties agree to transfer such material the U.S. Commission must determine whether such transfer falls within the scope of an Agreement for Cooperation between the U.S. and the other nation, group of nations or international organization.

The U.S. guarantees that no special nuclear material produced at the Tarapur Station and acquired by it, or an equivalent amount of the same type substituted therefore, shall be used for atomic weapons or for r & d on atomic weapons or for any other military purpose.

Agreement with the IAEA - Recognizing the desirability of making use of the facilities and services of the IAEA, the Parties agree in principle that at a suitable time, the IAEA would be requested to enter into a trilateral

agreement with the Parties for the implementation of the safeguards provisions of this Agreement. The United States was prepared, in principle, to include appropriate provisions in the trilateral for the application of Agency safeguards for SNM produced in the Tarapur Station, as may be received in the U.S., or equivalent material substituted therefor.

In addition, after the IAEA adopted a system of safeguards for reactors the size of the Tarapur Sation, the Parties agreed to consult to determine if this system would be consistent with the safeguards provisions of the agreement. If so. the Parties would request the Agency to enter into a trilateral agreement. The Indian Government could specify that the trilateral agreement would not be implemented until the Station reached reliable full-power operation.

In the event the Parties did not reach a mutually satisfactory agreement on the terms of a trilateral agreement, either Party may, by notification, terminate this bilateral agreement. Before either Party took steps to terminate, the Parties would carefully consider the economic effects. As for long term operations, neither Party will invoke its termination rights until the other Party has been given sufficient advance notice to permit arrangements by India for an alternative source of power or to permit adjustment of U.S. production schedules. The United States agreed not to invoke its termination rights unless there has been widespread acceptance, by those nations with whom it has bilateral agreements, of the implementation of IAEA safeguards or provisions similar to those in this Agreement. In the event of termination by either Party, the Indian Government, at the request of the U.S. Government, shall return to the U.S. all special nuclear materials received pursuant to this Agreement and in its possession or the

possession of persons under its jurisdiction. The U.S. Government will then compensate India for the material at current domestic prices.

Definition - The following terms are defined in the Agreement: U.S. Commission, Tarapur Atomic Power Station, equipment and devices, persons, reactor, atomic weapon, special nuclear material, source material, parties, and reliable full power operation.

The United Kingdom - The agreement for nuclear power cooperation with the United Kingdom is shorter and less detailed than that with India. Its principal provisions follows.

Scope - The Parties agreed to assist each other in furthering the use of atomic energy for civil power applications, including merchant marine propulsion, subject to the availability of personnel and material, applicable laws, directives, regulations and license requirements in force in their respective countries. The assistance is to be on a reciprocal basis.

Restricted data and privately owned information are not to be communicated under the Agreement. The Parties are to exchange general information on the development of atomic energy for civil power applications. Detailed and applied information in this field are to be exchanged to such an extent and under such terms and conditions as may be agreed.

Responsibility for information and materials - The application or use of any exchanged information or materials is the responsibility of the receiving Party.

Materials - ERDA is to sell agreed upon quantities of enriched U-235 for fueling reactors in the U.K. civil nuclear power programs, including programs for merchant marine propulsion. Terms and conditions of these sales are to be agreed upon.

After December 31, 1968, the United States is committed to enter into contracts for producing and/or enriching, special nuclear material for the account of the U.K. for specified uses and subject to terms and conditions established by ERDA.

Contracts specifying quantities, enrichments, delivery schedules and other terms and conditions of supply or service are to be executed on a timely basis between the ERDA and the U.K. Authority.

The enriched uranium supplied may contain up to twenty percent U-235. If there is a technical or economic justification, ERDA may supply material containing more than 20% U-235.

Quantity of Material Transferred - The adjusted net quantity of enriched U-235 transferred from the U.S. to the U.K. during the period of this Agreement may not exceed 8000 kilograms in the aggregate. The following will be used to calculate this quantity:

From:

(1) The quantity of U-235 contained in enriched uranium transferred under said Articles, minus

(2) The quantity of U-235 contained in an equal quantity of uranium of normal isotopic assay,

Subtract:

(3) The aggregate of the quantities of U-235 contained in recoverable uranium of United States origin either transferred to the United States or to any other nation or group of nations with the approval of the United States pursuant to this Agreement, minus

(4) The quantity of U-235 contained in an equal quantity of uranium of uranium of normal isotopic assay.

Cooperation by Persons - Arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other Party for the transfer of materials, etc. subject to limitations in this Agreement.

Safeguards - The Parties agreed to request the IAEA to assume responsibility for applying safeguards to materials transferred.

In the event the Parties did not reach a mutually satisfactory agreement on the trilateral, either Party by notification, could terminate the Agreement. In the event of termination, the United Kingdom would at the United States' request, return all special nuclear material received and still in its possession or in the possession of persons under its jurisdiction. The United States would compensate the United Kingdom for its interest in these material at current domestic prices.

Guarantees - Both Parties guaranteed that:

No material transferred pursuant to this Agreement will be used for atomic weapons or for research on or development of atomic weapons or for any other military purpose.

No material transferred will be transferred to unauthorized persons or beyond the jurisdiction of either receiving Party without the written consent of the transferring Party. U.S. consent will not be given unless the transfer is within the scope of an Agreement for cooperation.

No special nuclear material produced through the use of any material transferred pursuant to this agreement may be used for atomic weapons or for research on development of atomic weapons or for any other military purpose. Further, they may not be transferred beyond the jurisdiction of the Party in which they were produced.

Definitions - Definitions for Authority, Commission, person, restricted data, and special nuclear material, are included in the Agreement.

Agreements with International Organizations

The United States has agreements for cooperation with the two principal international organizations for nuclear energy. One is with Euratom which is part of the European Economic Community, the other is with the International Atomic Energy Agency. The major provisions of these agreements follow.

Euratom

Scope of agreement - The preamble to the agreement sets out the scope of the cooperation. The United States and Euratom agreed to cooperate by establishing a joint program to bring into operation within EURATOM nuclear power plants having a total installed capacity of approximately one million kilowatts of electricity by December 31, 1963 (except that two reactors may be selected to be in operation by December 31, 1965) and to initiate a joint research and development program on these types of reactors.

Under the joint program, reactor projects were to be proposed, constructed, and operated by private or governmental organizations in the Community which are engaged in the power industry or in the nuclear energy field. Projects would be selected in accordance with technical standards, criteria (including radiation protection and reactor safety) and procedures developed by the then AEC (now ERDA) and EURATOM. In evaluating and

selecting reactor projects, the technical and economic features were to be considered and approved by both Parties while other features were to be considered and approved by the EURATOM.

The total capital cost, exclusive of fuel inventory of the nuclear power plants to be constructed under the program was estimated not to exceed the equivalent of $350 million to be financed by the U.S. and Euratom. The U.S. offered guarantees designed to limit financial risks associated with the fuel cycle.

The reactor R & D program aimed primarily at improving reactor performance, lowering fuel cycle costs, and developing plutonium recycle.

Materials to be provided - The U.S. agreed to sell or lease up to 30,000 kilograms of Uranium enriched in U-235, for joint projects as the Euratom Community requests. This net amount was to be the gross quantity of contained U-235 in uranium sold of leased to the Community less the quantity of contained U-235 in recoverable uranium resold or returned to the U.S., or transferred to another nation or group of nations with U.S. approval. By agreement, the United States could also sell additional quantities of SNM to the Community. Any lease of SNM by the U.S. Commission could be converted to a sale of material upon Euratom request, if such a sale was consistent with U.S. laws and policy. Details of the leasing arrangements are included in the Agreement.

The uranium supplied for use in power reactors may be enriched to 20% U-235. Upon request and at its discretion, the United States could supply part of the enriched uranium as material enriched up to 90% for use

in material testing reactors and research reactors, each capable of operating with a fuel load not exceeding 8 kilograms of contained U-235.

The agreement specified that contracts for sale or lease of SNM by the then AEC (now ERDA) would be between the AEC (ERDA) and the Euratom Supply Agency. The agreement included about a page of conditions for these contracts. Title to leased SNM would remain in the United States which would have "power and authority" over this material within the Community. Euratom could distribute transferred SNM to authorized users in the Community. Title to SNM produced in nuclear fuel sold by or leased from the United States remains in the Community.

Reprocessing - The U.S. agreed to reprocess spent fuel which the Community purchased from the U.S. When any source or special nuclear material leased from the U.S. requires reprocessing, it is to be performed at the discretion of ERDA by the United States or in other acceptable facilities. As otherwise agreed, the form and content of irradiated fuel elements may not be altered after their removal from reactors and prior to delivery at ERDA or other facilities. SNM or other material recovered from material returned to the United States for reprocessing will be returned to the Community, unless otherwise agreed. The United States will give prior notice if its facilities are not available to reprocess Euratom fuel.

Euratom has a first option to purchase SNM produced in reactors fueled with material obtained from the United States under this Agreement which is in excess of the Community's needs. If this option is not exercised by Euratom, the United States is prepared to purchase the material at current domestic prices.

Commitments to purchase of plutonium produced in any reactor constructed under the Joint Program were not to extend beyond a period of ten years of operation or December 31, 1973 or December 31, 1975 for certain reactors, unless extended by negotiation.

The U.S. Commission agreed to assist Euratom in obtaining reactor materials other than SNM from private U.S. organizations.

Persons under U.S. jurisdiction may make arrangements to transfer materials to authorized persons under EURATOM jurisdiction.

Information Exchange - All non-patentable information developed in connection with the R&D program will be delivered to all Parties for their use without further obligation.

ERDA and EURATOM will also exchange unclassified information on peaceful use of atomic energy, including technical advice in the design and construction of future reprocessing plants which the Community may decide to design and construct or sponsor.

The application or use of any information transferred is the responsibility of the recipient.

Liability - The Euratom Commission will seek to develop and secure the adoption, at the earliest date practical, of suitable measures to provide adequate financial protection against third party liability.

Guarantees - The Community guarantees that no material, equipment and devices transferred pursuant to the Agreement will be used for atomic weapons, research and development of atomic weapons, or any other military purpose.

No material is to be transferred to unauthorized persons unless the U.S. agrees and it falls within an Agreement for Cooperation.

No source or special nuclear material utilized in, recovered from, or produced as a result of the use of materials, equipment and devices transferred under this Agreement are to be used for atomic weapons, research and development of atomic weapons, or for any other military purposes.

Safeguards - The Community undertook the responsibility for establishing and implementing a safeguards and control system designed to give maximum assurance that any material, equipment or devices made available pursuant to this Agreement, and any source or special nuclear material derived from the use of such material, equipment and devices, are utilized solely for peaceful purposes. The Community agreed to consult with the IAEA in establishing and implementing its safeguards and control system. EURATOM agreed to:

1) Examine the design of equipment, devices and facilities, including nuclear reactors, to assure that they will not further any military purpose and that they will permit effective application of safeguards, if such equipment, devices and facilities:
   - are made available pursuant to this Agreement;
   - use, process, or fabricate materials relevant to safeguards which are received from the United States;
   - use any special nuclear material produced as the result of the use of equipment or material received from the United States;
2) Require the maintenance and production of operating records to assure the accountability of special nuclear materials;
3) Require that progress reports be prepared and delivered to EURATOM on projects utilizing material received from the United States;

4) Establish and require the deposit and storage under continuing safeguards, in Euratom facilities of special nuclear material not currently being utilized for peaceful purposes in the Community or otherwise transferred.

5) Establish an inspection organization which will have access at all times to relevant persons, places and data necessary to assure accounting of material. The inspection organization will also be in a position to make necessary independent measurements.

The United States, as the Community may request, agreed to assist in establishing the safeguards and control system. There are to be frequent consultations between the Parties to assure that the Community's safeguards system effectively meets the principles.

The Parties agreed to consult from time to time to determine whether there are any areas with regard to safeguards and control and matters of health and safety in which the IAEA might assist.

Further Agreements - The Parties anticipated further cooperation agreements. Member States of EURATOM which have concluded agreements with third countries for cooperation in nuclear energy prior to the date of entry into force of this Treaty agreed to enter into obligations under those agreements by the Community.

Existing agreements between EURATOM members and the United States were not to be modified by the joint program, although modification could be made by joint agreement.

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Liability - Euratom agreed to indemnify and safe harmless the United States against damages or third party liability arising from the joint program.

Definitions - Definitions for Person, special nuclear material, source material, parties, and Euratom supply agency are included.

The International Atomic Energy Agency

Definitions

The following terms are defined in the agreement with the IAEA: agency, United States, Parties, agency statute, person, reactor material, source material, special nuclear material, and agency activity.

U.S. supply of enriched uranium

The U.S. agreed to make available 5,000 kilograms of contained U-235 to the Agency for its activities pursuant to the Agency Statute. The U.S. also agreed to provide amounts of SNM to match the sum of all quantities of SNM made available by all other Members of the Agency prior to July 1, 1960. Additional amounts may also be supplied. The uranium supplied may be enriched up to 20% U-235 unless the parties agree to a higher enrichment for uranium used in research reactors, material testing reactors or for research purposes.

The SNM made available to the Agency is to be used at the Agency's direction and distributed by the Agency in accordance with its Statute, rules and regulations. When requested by the Agency, the U.S. is to deliver the material to the Agency or to a Member or group of members designated by the Agency. Form, composition, delivery, etc., are to be agreed upon.

The United States agreed to assist the Agency in obtaining source and reactor materials from persons in the U.S., if the Agency wishes. If no commercial sources are available to the Agency on reasonable terms, the United States may make such material available to the Agency.

The United States may, at the Agency's request and subject to U.S. laws and the Agency Statute, purchase special nuclear material recovered or produced from special nuclear material and source material as a result of Agency activities. These are to be used solely for peaceful applications. Prices, terms, and conditions for these materials will be agreed upon.

Warranties

The use of any materials made available under the Agreement is the responsibility of the IAEA. All leasing agreements are to contain a provision relieving the lessor of liability.

Subject to applicable laws persons under the jurisdiction of the United States will be permitted to arrange to transfer and export, material, equipment and facilities and person needed services for the Agency, a Member or group of Members.

Guarantees

The Agency guarantees that:

(1) Safeguards set forth in the Agency Statute will be maintained and implemented with respect to the items made available by the United States for Agency activities;

(2) No material, equipment or facilities transferred pursuant to the Agreement will be used for atomic weapons, research and development of atomic weapons, or any military purposes.

(3) Items used transferred or re-transferred pursuant to this Agreement are to be used or transferred only in accordance with the Agency Statute and this Agreement.

APPENDIX II

COMPARATTVE TEXTS OF AGREEMENTS FOR COOPERATION FOR:

RESEARCH AND POWER (PORTUGAL)

RESEARCH ONLY (INDONESIA)

POWER ONLY (UNITED KINGDOM)

APPENDIX II. COMPARATIVE TEXTS OF AGREEMENTS FOR COOPERATION

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DEFINITIONS

RESEARCH AND POWER

ARTICLE I

For the purposes of this Agreement

(1) "Parties" means the Government of the United States of America, including the Commission on behalf of the Government of the United States of America, and the Government of Portugal, including the Junta on behalf of the Government of Portugal. "Party" means one of the above Parties.

(2) "Commission" means the United States Atomic Energy Commission.

(3) "Junta" means the Junta de Energia Nuclear of Portugal.

(4) "Atomic weapon" means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device (where such means is a separable and divisible part of the device), the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device.

(5) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

(6) "Equipment and devices" and "equipment or devices" mean any instrument, apparatus, or facility, and include any facility, except an atomic weapon, capable of making use of or producing special nuclear material, and component parts thereof.

(7) "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency, or government corporation but does not include the Parties to this Agreement.

(8) "Reactor" means an apparatus, other than an atomic weapon, in which a self-supporting fission chain reaction is maintained by utilizing uranium, plutonium or thorium, or any combination of uranium, plutonium or thorium.

(9) "Restricted Data" means all data concerning (a) design, manufacture, or utilization of atomic weapons, (b) the production of special nuclear material, or (c) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the category of Restricted Data by the appropriate authority.

(10) "Safeguards" means a system of controls designed to assure that any materials, equipment and devices committed to the peaceful uses of atomic energy are not used to further any military purpose.

(11) "Source material" means (a) uranium, thorium or any other material which is determined by the Commission or the Junta to be source material, or (b) ores containing one or more of the foregoing materials, in such concentration as the Commission or the Junta may determine from time to time.

RESEARCH ONLY

ARTICLE I

For the purposes of this Agreement:

(1) "Parties" means the Government of the United States of America, including the Commission on behalf of the Government of the United States of America, and the Government of the Republic of Indonesia. "Party" means one of the above 'Parties'.

(2) "Commission" means the United States Atomic Energy Commission.

(3) "Atomic weapon" means any device utilizing atomic energy, exclusive of the means for transporting or propelling the device (where such means is a separable and divisible part of the device), the principal purpose of which is for use as, or for development of, a weapon, a weapon prototype, or a weapon test device.

(4) "Byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

(5) "Equipment and devices" and 'equipment or devices' mean any instrument, apparatus, or facility, and include any facility, except an atomic weapon, capable of making use of or producing special nuclear material, and component parts thereof.

(6) "Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency, or government corporation but does not include the Parties to this Agreement.

(7) "Research reactor" means a reactor which is designed for the production of neutrons and other radiations for general research and development purposes, medical therapy and diagnosis, or training in nuclear science and engineering. The term does not cover power reactors, power demonstration reactors, or reactors designed primarily for the production of special nuclear material.

(8) "Restricted Data" means all data concerning (1) design, manufacture, or utilization of atomic weapons, (2) the production of special nuclear material, or (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the category of Restricted Data by the appropriate authority.

(9) "Safeguards" means a system of controls designed to assure that any material, equipment and devices committed to the peaceful uses of atomic energy are not used to further any military purpose.

POWER ONLY

ARTICLE IX

Definitions

For the purpose of this Agreement:

"The Authority" means the United Kingdom Atomic Energy Authority.

"The Commission" means the United States Atomic Energy Commission.

"Person" means any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency or government corporation other than the Commission and the Authority.

"Restricted Data" means all data concerning: (1) design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy, but shall not include data declassified or removed from the category of Restricted Data by the appropriate authority.

"Special nuclear material" means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission and the Authority determine to be special nuclear material; or (2) any material artificially enriched by any of the foregoing.

DEFINITIONS (cont'd)

RESEARCH AND POWER

(12) "Special nuclear material" means (a) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the Commission or the Junta determines to be special nuclear material, or (b) any material artificially enriched by any of the foregoing.

(13) "Superseded Agreements" means the Agreements for Cooperation Between the Government of the United States of America and the Government of Portugal signed by the Parties on July 3, 1969 and on July 21, 1955, as amended.

RESEARCH ONLY

(10) 'Source material'' means (1) uranium, thorium, or any other material which is determined by the Commission or the Government of the Republic of Indonesia to be source material, or (2) ores containing one or more of the foregoing materials, in such concentration as the Commission or the Government of the Republic of Indonesia may determine from time to time.

(11) 'Special nuclear material'' means (1) plutonium, uranium enriched in the isotope 233 or the isotope 235, and any other material which the Commission or the Government of the Republic of Indonesia determines to be special nuclear material, or (2) any material artificially enriched by any of the foregoing."

POWER ONLY

SCOPE

RESEARCH AND POWER

ARTICLE II

A. Subject to the provisions of this Agreement, the availability of personnel and material, and the applicable laws, regulations, and license requirements in force in their respective countries, the Parties shall cooperate with each other in the achievement of the uses of atomic energy for peaceful purposes.

RESEARCH ONLY

ARTICLE II

"A. Subject to the provisions of this Agreement, the availability of personnel and material, and the applicable laws, regulations, and license requirements in force in their respective countries, the Parties shall cooperate with each other in the achievement of the uses of atomic energy for peaceful purposes.

POWER ONLY

ARTICLE I

A. Subject to the availability of personnel and material, and the applicable laws, directives, regulations and license requirements in force in their respective countries, the Parties shall assist each other, as hereinafter described, in furthering the use of atomic energy in civil power applications, including merchant marine propulsion. It is the intent of the Parties that such assistance shall be rendered on a reciprocal basis.

EXCHANGE OF INFORMATION (RESTRICTED DATA)

RESEARCH AND POWER

ARTICLE II

B. Restricted Data shall not be communicated under this Agreement, and no materials or equipment and devices shall be transferred, and no services shall be furnished, under this Agreement, if the transfer of any such materials or equipment and devices or the furnishing of any such services involves the communication of Restricted Data.

RESEARCH ONLY

ARTICLE II

"B. Restricted Data shall not be communicated under this Agreement, and no materials or equipment and devices shall be transferred, and no services shall be furnished, under this Agreement, if the transfer of any such materials or equipment and devices or the furnishing of any such services involves the communication of Restricted Data.

POWER ONLY

ARTICLE I

B. Restricted Data shall not be communicated under this Agreement, and no material shall be transferred, and no service shall be furnished under this Agreement if the transfer of such material or the furnishing of such service involves the communication of Restricted Data.

EXCHANGE OF INFORMATION (PRIVATE INFORMATION)

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
ARTICLE II C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate.	ARTICLE II "C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate."	ARTICLE "I C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate because the information is privately owned or has been received from another Government.

EXCHANGE OF INFORMATION (SUBJECTS)

RESEARCH AND POWER

ARTICLE III

Subject to the provisions of Article II, the Parties may exchange unclassified information with respect to the application of atomic energy to peaceful uses and the considerations of health and safety connected therewith. The exchange of information provided for in this Article will be accomplished through various means, including reports, conferences, and visits to facilities, and may include information in the following fields:

(1) Development, design, construction, operation, and use of research, materials testing, experimental, demonstration power, and power reactors, and reactor experiments;

(2) The use of radioactive isotopes and source material, special nuclear material, and byproduct material in physical and biological research, medicine, agriculture, and industry; and

(3) Health and safety considerations related to the foregoing.

RESEARCH ONLY

ARTICLE III

"A. Subject to the provisions of Article II, the Parties will exchange unclassified information with respect to the application of atomic energy to peaceful uses and the problems of health and safety connected therewith. The exchange of information provided for in this Article shall be accomplished through various means, including reports, conferences, and visits to facilities, and shall include information in the following fields:

(1) Design, construction, operation, and use of research reactors, materials testing reactors, and reactor experiments;

(2) The use of radioactive isotopes and source material, special nuclear material, and byproduct material in physical and biological research, medicine, agriculture, and industry; and

(3) Health and safety problems related to the foregoing.

POWER ONLY

ARTICLE II

The Parties shall exchange general information in the development of atomic energy in civil power applications. Detailed information and applied information in this field shall be exchanged to such an extent and under such terms and conditions as may be agreed.

TRANSFER OF MATERIAL AND ACCESS TO FACILITIES

RESEARCH AND POWER

ARTICLE IV

A. Materials of interest in connection with the subjects of agreed exchange of information, as provided in Article III and subject to the provisions of Article II, including source material, heavy water, byproduct material, other radioisotopes, stable isotopes, and special nuclear material for purposes other than fueling reactors and reactor experiments, may be transferred between the Parties for defined applications in such quantities and under such terms and conditions as may be agreed when such materials are not commercially available.

B. Subject to the provisions of Article II and under such terms and conditions as may be agreed, specialized research facilities and reactor materials testing facilities of the Parties may be made available for mutual use consistent with the limits of space, facilities, and personnel conveniently available when such facilities are not commercially available.

C. With respect to the subjects of agreed exchange of information as provided in Article III and subject to the provisions of Article II, equipment and devices may be transferred from one Party to the other under such terms and conditions as may be agreed. It is recognized that such transfers will be subject to limitations which may arise from shortages of supplies or other circumstances existing at the time.

RESEARCH ONLY

ARTICLE V

"A. Materials of interest in connection with the subjects of agreed exchange of information, as provided in Article III and subject to the provisions of Article II, including source material, heavy water, byproduct material, other radioisotopes, stable isotopes, and special nuclear material for purposes other than fueling reactors and reactor experiments, may be transferred between the Parties for defined applications in such quantities and under such terms and conditions as may be agreed when such materials are not commercially available.

"B. Subject to the provisions of Article II and under such terms and conditions as may be agreed, specialized research facilities and reactor materials testing facilities of the Parties may be made available for mutual use consistent with the limits of space, facilities, and personnel conveniently available when such facilities are not commercially available.

"C. With respect to the subjects of agreed exchange of information as provided in Article III and subject to the provisions of Article II, equipment and devices may be transferred from one Party to the other under such terms and conditions as may be agreed. It is recognized that such transfers will be subject to limitations which may arise from shortages of supplies or other circumstances existing at the time."

ARTICLE IX

* * * and no material, including equipment and devices, transferred to the Government of the Republic of Indonesia or authorized persons under its jurisdiction pursuant to this Agreement will be transferred to unauthorized persons or beyond the jurisdiction of the Government of the Republic of Indonesia, except as the Commission may agree to such a transfer to another nation or group of nations, and then only if, in the opinion of the Commission, the transfer of the material is within the scope of an Agreement for Cooperation between the Government of the United States of America and the other nation or group of nations."

POWER ONLY

RESPONSIBILITY OF RECEIVING PARTY

RESEARCH AND POWER

ARTICLE IV

The application or use of any information (including design drawings and specifications), and any material, equipment and devices, exchanged or transferred between the Parties under this Agreement or the superseded Agreements shall be the responsibility of the Party receiving it, and the other Party does not warrant the accuracy or completeness of such information and does not warrant the suitability of such information, material, equipment and devices for any particular use or application.

RESEARCH ONLY

ARTICLE III

B. The application or use of any information (including design drawings and specifications), and any material, equipment and devices, exchanged or transferred between the Parties under this Agreement, shall be the responsibility of the Party receiving it, and the other Party does not warrant the accuracy or completeness of such information and does not warrant the suitability of such information, material, equipment and devices for any particular use or application."

POWER ONLY

ARTICLE III

The application or use of any information (including design drawings and specifications) or material exchanged or transferred under this Agreement shall be the responsibility of the Party receiving it, and the other Party does not warrant the accuracy or completeness of such information and does not warrant the suitability of such information or material for any particular use or application.

COOPERATION BETWEEN PERSONS

RESEARCH AND POWER

ARTICLE VI

A. With respect to the application of atomic energy to peaceful uses, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other Party for the transfer of equipment and devices and materials other than special nuclear material and for the performance of services with respect thereto.

B. With respect to the application of atomic energy to peaceful uses, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other Party for the transfer of special nuclear material and for the performance of services with respect thereto for the uses specified in Articles IV and VII and subject to the relevant provisions of Article VIII and to the provisions of Article IX.

C. The Parties agree that the activities referred to in paragraphs A and B of this Article shall be subject to the limitations in Article II and to the policies of the Parties with regard to transactions involving the authorized persons referred to in paragraphs A and B of this Article.

RESEARCH ONLY

ARTICLE VII

"A. With respect to the application of atomic energy to peaceful uses, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other Party for the transfer of equipment and devices and materials other than special nuclear material and for the performance of services with respect thereto.

"B. With respect to the application of atomic energy to peaceful uses, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other Party for the transfer of special nuclear material and for the performance of services with respect thereto for the uses specified in Articles IV and V and subject to the limitations of Article IV, paragraph B.

"C. The Parties agree that the activities referred to in paragraphs A and B of this Article shall be subject to the limitations in Article II and to the policies of the Parties with regard to transactions involving the authorized persons referred to in paragraphs A and B of this Article."

POWER ONLY

ARTICLE VI

With respect to the subject matter of this Agreement, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other for the transfer of materials, including special nuclear material, and for the performance of services. Such arrangements shall be subject to the limitations in Articles I and V and to the policies of the Parties with regard to transactions involving the authorized persons referred to in the preceding sentence.

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RESEARCH AND POWER

ARTICLE VIII

A. Subject to the availability of capacity in Commission facilities for uranium enrichment and within the quantity authorized in Article IX for transfer, contracts with the Government of Portugal, or with authorized persons under its jurisdiction, may be entered into by the Commission as herein set forth for the production or enrichment of uranium enriched in the isotope U-235 for use as fuel in power applications undertaken within Portugal. It is understood by the Parties that, at such times as the Government of Portugal, or such authorized persons, have requirements for such services and are prepared to execute firm contracts which set forth the agreed delivery schedules and other terms and conditions of supply, the Government of Portugal or such authorized persons will have access on an equitable basis with other purchasers of such services to uranium enrichment capacity then available in Commission facilities and not already allocated.

B. Additionally, upon request by the Government of Portugal or authorized persons under its jurisdiction, the Commission may, at its option and under terms and conditions as may be agreed, sell uranium enriched in the isotope U-235 in such amounts as are within the quantity authorized in Article IX for transfer for use as fuel in power applications undertaken within Portugal.

C. Under such terms and conditions as may be agreed, the Commission may transfer (including, inter alia, supply through enrichment services contracts) to the Government of Portugal, or authorized persons under its jurisdiction, uranium enriched in the isotope U-235 for use as fuel in reactor experiments and reactors other than those covered under paragraphs A and B of this Article, including reactors for research, materials testing, experimental, scientific, and industrial uses.

RESEARCH ONLY

ARTICLE IX

A. As may be agreed, the Commission will transfer to the Government of the Republic of Indonesia or, pursuant to Article VII, to authorized persons under its jurisdiction, uranium enriched in the isotope U-235 for use as fuel in defined research applications, including research reactors, materials testing reactors, and reactor experiments, which the Government of the Republic of Indonesia decides to construct or operate or authorizes private persons to construct or operate in the Republic of Indonesia. Contracts setting forth the terms, conditions, and delivery schedule of each transfer shall be agreed upon in advance.

POWER ONLY

ARTICLE IX

A. The Commission is prepared to sell to the United Kingdom, on terms and conditions to be agreed, such quantities as may be agreed of uranium enriched in the isotope U-235 for fueling reactors in the United Kingdom civil nuclear power programs (including programs for merchant marine propulsion).

B. The Commission is also prepared to enter into contracts for the producing or enriching, or both, after December 31, 1968, in facilities owned by the Commission, of special nuclear material for the account of the United Kingdom, for the uses specified in paragraph A of this Article to such extent and subject to such terms and conditions as may be established by the Commission.

C. With regard to the transactions provided for in this Article it is understood that:

(1) contracts specifying quantities, enrichments, delivery schedules and other terms and conditions of supply or service will be executed on a timely basis between the Commission and the Authority;

o

(2) prices for enriched uranium sold or for services performed, and the advance notice required for delivery, will be those in effect at the time of delivery for users in the United States. The Commission may agree to supply enriched uranium or perform enrichment services upon shorter notice, subject to assessment of such surcharge to the usual base price as the Commission may consider reasonable to cover abnormal production costs incurred by the Commission by reason of such shorter notice.

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
ARTICLE III D. Special nuclear material other than uranium enriched in the isotope U-235 may be transferred to the Government of Portugal, or to authorized persons under its jurisdiction, for use as fuel in reactors and reactor experiments, provided that, if the transfers are made by the Commission, it may transfer quantities of such material only to the extent that they fall within an authorized ceiling therefor set forth in Article IX and that the terms and conditions of each such transfer shall be agreed upon in advance.		

ENRICHMENT OF URANIUM SUPPLIED

RESEARCH AND POWER

ARTICLE VIII

A. The enriched uranium supplied under this Agreement may contain up to twenty percent (20%) in the isotope U-235. A portion of the uranium enriched in the isotope U-235 so supplied may be made available as material containing more than twenty percent (20%) in the isotope U-235 when the Commission finds there is a technical or economic justification for such a transfer.

RESEARCH ONLY

ARTICLE IV

D. The enriched uranium supplied hereunder may contain up to twenty percent (20%) in the isotope U-235. All or a portion of the foregoing special nuclear material may be made available as uranium enriched to more than twenty percent (20%) by weight in the isotope U-235 when the Commission finds there is a technical or economic justification for such a transfer for use in research reactors, materials testing reactors, and reactor experiments, each capable of operating with a fuel load not to exceed eight (8) kilograms of the isotope U-235 contained in such uranium.

POWER ONLY

ARTICLE IV

D. The enriched uranium supplied hereunder may contain up to twenty percent (20%) in the isotope U-235. The Commission, however, may make available a portion of the enriched uranium supplied hereunder as material containing more than 20% in the isotope U-235 when there is a technical or economic justification for such a transfer.

RESEARCH AND POWER

ARTICLE VII

B. Subject to the provisions of Article IX, the quantity of uranium enriched in the isotope U-235 transferred under Article VI or Article VII and under the jurisdiction of the Governmedt of Portugal for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments, plus such additional quantity as, in the opinion of the Parties, is necessary for the efficient and continuous operation of such reactors or reactor experiments.

RESEARCH ONLY

ARTICLE IV

B. The net amount of U-235 in enriched uranium transferred under this Article during the period of this Agreement, shall not at any time exceed twenty-five (25) kilograms. This net amount shall be the gross quantity of such contained U-235 in uranium transferred during the period of this Agreement less the quantity of such contained U-235 in recoverable uranium which has been resold or otherwise returned to the United States of America during the period of this Agreement or transferred to any other nation or group of nations with the approval of the Government of the United States of America.

C. Within the limitations contained in paragraph B of this Article, the quantity of uranium enriched in the isotope U-235 transferred under this Article and under the jurisdiction of the Government of the Republic of Indonesia for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments, plus such additional quantity as, in the opinion of the Commission, is necessary to permit the efficient and continuous operation of such reactors or reactor experiments.

POWER ONLY

ARTICLE IV

E. It is agreed that, should the total quantity of enriched uranium which the Commission has agreed to provide pursuant to this and other Agreements for Cooperation reach the maximum quantity of enriched uranium which the Commission has available for such purposes, and should the United Kingdom not have executed contracts covering the adjusted net quantity specified in Article V, the Commission may request, upon reasonable notice, that the United Kingdom execute contracts for all or any part of such enriched uranium as is not then under contract. It is understood that, should the United Kingdom not execute contracts in accordance with a request by the Commission hereunder, the Commission shall be relieved of all obligations to the United Kingdom with respect to the enriched uranium for which contracts have been so requested.

ARTICLE V

The adjusted net quantity of U-235 in enriched uranium transferred from the United States to the United Kingdom under Article IV and Article VI during the period of this Agreement for Cooperation shall not exceed 8000 kilograms in the aggregate. The following method of computation shall be used in calculating transfers, within the said ceiling quantity of 8000 kilograms of U-235, made under said Articles:

From:

(1) The quantity of U-235 contained in enriched uranium transferred under said Articles, minus

(2) The quantity of U-235 contained in an equal quantity of uranium of normal isotopic assay,

Subtract:

(3) The aggregate of the quantities of U-235 contained in recoverable uranium of United States origin either transferred to the United States or to any other nation or group of nations with the approval of the United States pursuant to this Agreement, minus

(4) The quantity of U-235 contained in an equal quantity of uranium of normal isotopic assay.

RESEARCH AND POWER

ARTICLE VIII

C. When any special nuclear material received from the United States of America pursuant to this Agreement or the superseded Agreements requires reprocessing, or any irradiated fuel elements containing fuel material received from the United States of America pursuant to this Agreement or the superseded Agreements are to be removed from a reactor and are to be altered in form or content, such reprocessing or alteration shall be performed in facilities acceptable to both Parties upon a joint determination that the provisions of Article XI may be effectively applied.

RESEARCH ONLY

ARTICLE IX

"E. When any special nuclear material received from the United States of America pursuant to this Agreement requires reprocessing, or any irradiated fuel elements containing fuel material received from the United States of America pursuant to this Agreement are to be removed from a reactor and are to be altered in form or content, such reprocessing or alteration shall be performed in facilities acceptable to both Parties upon a joint determination of the Parties that the provisions of Article VIII may be effectively applied.

POWER ONLY

RESEARCH AND POWER

ARTICLE VIII

D. Special nuclear material produced as a result of irradiation processes in any part of the fuel that may be leased by the Commission under this Agreement, or may have been leased under the superseded Agreements, shall be for the acount of the lessee and, after reprocessing as provided in paragraph C of this Article, title to such produced material shall be in the lessee unless the Commission and the lessee otherwise agree.

E. No special nuclear material produced through the use of material transferred to the Government of Portugal or to authorized persons under its jurisdiction pursuant to this Agreement or the superseded Agreements, will be transferred to the jurisdiction of any other nation or group of nations, unless such nation or group of nations has an appropriate agreement for cooperation with the Government of the United States of America or guarantees the use of such special nuclear material for peaceful purposes under safeguards acceptable to the Parties.

RESEARCH ONLY

ARTICLE IV

F. Special nuclear material produced as a result of irradiation processes in any part of fuel leased by the Commission under this Agreement shall be for the account of the lessee and, after reprocessing as provided in paragraph E of this Article, title to such produced material shall be in the lessee unless the Commission and the lessee otherwise agree.

G. No special nuclear material produced through the use of material transferred to the Government of the Republic of Indonesia or to authorized persons under its jurisdiction, pursuant to this Agreement, will be transferred to any other nation or group of nations, except as the Commission may agree to such a transfer.

POWER ONLY

RECEIVERS RESPONSIBILITY AND INDEMNIFICATION

RESEARCH AND POWER

ARTICLE VIII

F. Some atomic energy materials which may be provided in accordance with this Agreement, or which may have been provided under the superseded Agreements, are harmful to persons and property unless handled and used carefully. After delivery of such materials, the Government of Portugal shall bear all responsibility, insofar as the Government of the United States of America is concerned, for the safe handling and use of such materials. With respect to any special nuclear material or fuel elements which the Commission may, pursuant to this Agreement, lease to the Government of Portugal or to any person under its jurisdiction, or may have leased pursuant to the superseded Agreements, the Government of Portugal shall indemnify and save harmless the Government of the United States of America against any and all liability (including third party liability) for any cause whatsoever arising out of the production or fabrication, the ownership, the lease and the possession and use of such special nuclear material or fuel elements after delivery by the Commission to the Government of Portugal or to any person under its jurisdiction.

RESEARCH ONLY

ARTICLE III

"H. Some atomic energy materials which the Commission may be requested to provide in accordance with this Agreement are harmful to persons and property unless handled and used carefully. After delivery of such materials, the Government of the Republic of Indonesia shall bear all responsibility, insofar as the Government of the United States of America is concerned, for the safe handling and use of such materials. With respect to any special nuclear material or fuel elements which the Commission may, pursuant to this Agreement, lease to the Government of the Republic of Indonesia or to any person under its jurisdiction, the Government of the Republic of Indonesia shall indemnify and save harmless the Government of the United States of America against any and all liability (including third party liability) for any cause whatsoever arising out of the production or fabrication, the ownership, the lease, and the possession and use of such special nuclear material or fuel elements after delivery by the Commission to the Government of the Republic of Indonesia or to any person not under its juridsiction

POWER ONLY

LIMIT ON SEPARATIVE WORK

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
ARTICLE IX The separative work required to produce the uranium enriched in the isotope U-235 transferred under this Agreement, or the superseded Agreements, from the United States of America to Portugal for power applications shall not exceed that necessary to support the fuel cycles of reactors having a total installed capacity of three thousand (3,000) megawatts (electric).		

GUARANTEES

RESEARCH AND POWER

ARTICLE X

The Government of Portugal guarantees that:

(1) Safeguards provided in Article XI shall be maintained.

(2) No material, including equipment and devices, transferred to the Government of Portugal or authorized persons under its jurisdiction by purchase or otherwise pursuant to this Agreement or the superseded Agreements, and no special nuclear material produced through the use of such material, equipment and devices, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose.

(3) No material, including equipment and devices, transferred to the Government of Portugal or to authorized persons under its jurisdiction pursuant to this Agreement or the superseded Agreements will be transferred to unauthorized persons or beyond the jurisdiction of the Government of Portugal except as the Commission may agree to such a transfer to the jurisdiction of another nation or group of nations, and then only if, in the opinion of the Commission, the transfer is within the scope of an agreement for cooperation between the Government of the United States of America and the other nation or group of nations.

RESEARCH ONLY

ARTICLE IX

"The Government of the Republic of Indonesia guarantees that:

(a) Safeguards provided in Article VIII shall be maintained.

(b) No material, including equipment and devices, transferred to the Government of the Republic of Indonesia or authorized persons under its jurisdiction by purchase or otherwise pursuant to this Agreement, and no special nuclear material produced through the use of such material, equipment or devices, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose; and no material, including equipment and devices, transferred to the Government of the Republic of Indonesia or authorized persons under its jurisdiction pursuant to this Agreement will be transferred to unauthorized persons or beyond the jurisdiction of the Government of the Republic of Indonesia, except as the Commission may agree to such a transfer to another nation or group of nations, and then only if, in the opinion of the Commission, the transfer of the material is within the scope of an Agreement for Cooperation between the Government of the United States of America and the other nation or group of nations."

POWER ONLY

ARTICLE VIII

The Parties guarantee that:

A. No material transferred pursuant to this Agreement shall be used for atomic weapons or for research on or development of atomic weapons or for any other military purpose.

B. No material transferred pursuant to this Agreement shall be transferred to any unauthorized person or beyond the jurisdiction of the Party receiving it without the written consent of the Party to this Agreement from which or by permission of which it was received. Such consent will not be given on behalf of the United States unless the transfer in respect of which it is requested is within the scope of an agreement for cooperation made in accordance with Section 123 of the United States Atomic Energy Act of 1954,[1] as amended.

C. No special nuclear material produced through the use of any material transferred pursuant to this Agreement shall be used for atomic weapons or for research on or development of atomic weapons or for any other military purpose, or shall be transferred beyond the jurisdiction of the Party in whose jurisdiction it is produced without the written consent of the other Party.

D. Their respective undertakings set forth in Article VII with regard to safeguards shall be maintained.

COMMITMENT TO CIVIL USE

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
ARTICLE XI A. The Government of the United States of America and the Government of Portugal emphasize their common interest in assuring that any material, equipment or devices made available to the Government of Portugal or any person under its jurisdiction pursuant to this Agreement or the superseded Agreement shall be used solely for civil purposes.	ARTICLE VIII "A. The Government of the United States of America and the Government of the Republic of Indonesia emphasize their common interest in assuring that any material, equipment or devices made available to the Government of the Republic of Indonesia or any person under its jurisdiction pursuant to this Agreement shall be used solely for civil purposes.	

U.S. RIGHTS

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
ARTICLE XI B. Except to the extent that the safeguards rights provided for in this Agreement are suspended by virtue of the application of safeguards of the International Atomic Energy Agency, as provided in Article XII, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights: (1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design of any (a) reactor, and (b) other equipment and devices the design of which the Commission determines to be relevant to the effective application of safeguards, which are to be made available under this Agreement, or have been made available under the superseded Agreements, to the Government of Portugal or to any person under its jurisdiction by the Government of the United States of America or any person under its jurisdiction, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the Commission; (2) With respect to any source material or special nuclear material made available to the Government of Portugal or to any person under its jurisdiction under this Agreement or the superseded Agreements by the Government of the United States of America or any person under its jurisdiction and any source material or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment or devices so made available: (a) source material, special nuclear material, moderator material, or other material designated by the Commission, (b) reactors, and	ARTICLE VIII "B. Except to the extent that the safeguards rights provided for in this Agreement are suspended by virtue of the application of safeguards of the International Atomic Energy Agency, as provided in Article X, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights: (1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design and operation of any (a) reactor, and (b) other equipment and devices the design of which the Commission determines to be relevant to the effective application of safeguards, which are to be made available under this Agreement to the Government of the Republic of Indonesia or to any person under its jurisdiction by the Government of the United States of America or any person under its jurisdiction, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the Commission: (2) With respect to any source material or special nuclear material made available to the Government of the Republic of Indonesia or to any person under its jurisdiction under this Agreement by the Government of the United States of America or any person under its jurisdiction and any source material or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment or devices so made available: (a) source material, special nuclear material, moderator material, or other material designated by the Commission, (b) reactors, and (c) any other equipment or devices designated by the Commission as an item to be made available on the condition that the provisions of this paragraph B(2) will apply,	

U.S. RIGHTS (cont'd)

RESEARCH AND POWER	RESEARCH ONLY	POWER ONLY
(c) any other equipment or devices designated by the Commission as an item to be made available on the condition that the provisions of this paragraph B(2) will apply, (i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials, and (ii) to require that any such material in the custody of the Government of Portugal or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guarantees set forth in Article X; (3) To require the deposit in storage facilities designated by the Commission of any of the special nuclear material referred to in paragraph B(2) of this Article which is not currently utilized for civil purposes in Portugal and which is not transferred pursuant to Article VIII or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties; (4) To designate, after consultation with the Government of Portugal, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of Portugal, shall have access in Portugal to all places and data necessary to account for the source material and special nuclear material which are subject to paragraph B(2) of this Article to determine whether there is compliance with this Agreement and to make such independent measurements as may be deemed necessary; (5) In the event of noncompliance with the provisions of this Article or the guarantees set forth in Article X and the failure of the Government of Portugal to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment and devices referred to in paragraph B(2) of this Article; (6) To consult with the Government of Portugal in the matter of health and safety. C. The Government of Portugal undertakes to facilitate the application of safeguards provided for in this Article.	(i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials, and (ii) to require that any such materials in the custody of the Government of the Republic of Indonesia or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guarantees set forth in Article IX; (3) To require the deposit in storage facilities designated by the Commission of any of the special nuclear material referred to in paragraph B(2) of this Article which is not currently utilized for civil purposes in the Republic of Indonesia and which is not transferred pursuant to Article IV of this Agreement or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties; (4) To designate, after consultation with the Government of the Republic of Indonesia, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of the Republic of Indonesia, shall have access in the Republic of Indonesia to all places and data necessary to account for the source material and special nuclear material which are subject to paragraph B(2) of this Article to determine whether there is compliance with this Agreement and to make such independent measurements as may be deemed necessary; (5) In the event of non-compliance with the provisions of this Article or the guarantees set forth in Article IX and the failure of the Government of the Republic of Indonesia to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment and devices referred to in paragraph B(2) of this Article; (6) To consult with the Government of the Republic of Indonesia in the matter of health and safety. "C. The Government of the Republic of Indonesia undertakes to facilitate the application of the safeguards provided for in this Article."	

IAEA SAFEGUARDS

RESEARCH AND POWER

ARTICLE XII

A. The Government of the United States of America and the Government of Portugal note that, by an agreement signed by them and the International Atomic Energy Agency on July 11, 1969, [1] the Agency has been applying safeguards to materials, equipment and facilities transferred to the jurisdiction of the Government of Portugal under the superseded Agreements. The Parties, recognizing the desirability of continuing to make use of the facilities and services of the International Atomic Energy Agency, agree that Agency safeguards shall continue to apply to materials, equipment and facilities transferred under the superseded Agreements or to be transferred under this Agreement.

B. The continued application of Agency safeguards pursuant to this Article will be accomplished either as provided in the above-mentioned trilateral agreement among the Parties and the Agency, as it may be amended from time to time or supplanted by a new trilateral agreement, or as provided in an agreement which may be entered into between the International Atomic Energy Agency and the Government of Portugal pursuant to Article III of the Treaty on the Non-Proliferation of Nuclear Weapons. It is understood that, without modification of this Agreement, the safeguards rights accorded to the Government of the United States of America by Article XI of this Agreement will be suspended during the time and to the extent that the Government of the United States of America agrees that the need to exercise such rights is satisfied by a safeguards agreement as contemplated in this paragraph.

C. In the event the applicable safeguards agreement referred to in paragraph B of this Article should be terminated for any reason and, consequently, the Government of the United States of America should reassume the safeguards rights referred to in Article XI of this Agreement, the Parties shall examine the situation so created in the light of the obligations assumed by the Government of the United States of America under the terms of the Treaty on the Non-Proliferation of Nuclear Weapons, so that appropriate measures may be taken, if necessary, to comply satisfactorily with the above-mentioned obligations.

RESEARCH ONLY

ARTICLE X

"A. The Government of the United States of America and the Government of the Republic of Indonesia note that, by an agreement signed by them and the International Atomic Energy Agency on June 19, 1967, [1] the Agency has been applying safeguards to materials, equipment and facilities transferred to the Government of the Republic of Indonesia under this Agreement. The Parties agree that Agency safeguards shall continue to apply to such materials, equipment and facilities as provided in the trilateral agreement, as it may be amended from time to time or supplanted by a new trilateral agreement, recognizing that the safeguards rights accorded to the Government of the United States of America by Article VIII of this Agreement are suspended during the time and to the extent that Agency safeguards apply to such materials, equipment and facilities.

"B. In the event that the trilateral agreement referred to in paragraph A of this Article should be terminated prior to the expiration of this Agreement and the Parties should fail to agree promptly upon a resumption of Agency safeguards, either Party may, by notification, terminate this Agreement. In the event of termination by either Party, the Government of the Republic of Indonesia shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to this Agreement and still in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of the Republic of Indonesia or the persons under its jurisdiction for their interest in such material so returned at the Commission's schedule of prices then in effect in the United States of America."

POWER ONLY

ARTICLE VII

A. The United States and the United Kingdom, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency, agree that the Agency will be requested to assume responsibility for applying safeguards to materials transferred under this Agreement.

B. In the event the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement envisaged in paragraph A of this Article, either Party may, by notification, terminate this Agreement. In the event of termination by either Party, the United Kingdom shall, at the request of the United States, return to the United States all special nuclear material received pursuant to this Agreement and still in its possession or in the possession of persons under its jurisdiction. The United States will compensate the United Kingdom for its interest in such material so returned at the Commission's schedule of prices then in effect domestically.

APPENDIX III

Selected Chronology of International Activities of the AEC

Source: AEC Annual Reports to Congress, 1955-1974

The annual reports of the U.S. Atomic Energy Commission following the revision of the Atomic Energy Act in 1954 included brief highlights of international activities. There follows a chronology of selected items from these reports.

1955

--Twenty-seven nations entered into agreements for cooperation with the U.S. in developing the civil uses of atomic energy.

--The President enlarged the scope of Atoms for Peace Program by advocating the construction and demonstration of a nuclear-powered merchant ship.

--The President proffered financial aid to other nations in the construction of research reactors, and training and technological aid in the development of power reactors by friendly nations.

--The United Nations International Conference on Peaceful Uses of Atomic Energy was held in Geneva. The Conference was originally proposed by the U.S.

--The Commission opened a course for scientists and engineers from other nations in reactor engineering.

--The Commission continued support of libraries of unclassified atomic energy publications in other nations, a program which was begun in late 1954.

1956

--The United States participated in a conference to consider the basic charter of the IAEA at United Nations headquarters. The Conference adopted the statute of the IAEA.

--A total of 41 agreements for cooperation were completed with 39 nations.

--The first financial commitments under the President's plan for research assistance were made to reactor projects in Brazil, Denmark, the Netherlands and Spain.

--The number of technical libraries approved for presentation to other countries was increased to 42 plus three to international agencies.

--Through 1956, the Commission had approved sale of 129 tons of heavy water to Australia, France, India, Italy, Switzerland and in the United States for use in peaceful programs.

--The Commission continued support of libraries and training in other nations.

--The Commission and the Export-Import Bank agreed to joint action to provide assistance for the construction of nuclear powerplants and for research reactor projects in nations which had entered into agreements for cooperation with the United States.

--The United States participated in the July United Nations Disarmament Commission meeting.

1957

--At the end of the year, six reactors made in the United States were in operation in other countries, and licenses to export 16 others from the United States had been issued; nine new agreements for research and power and one for research became effective, five agreements were amended.

--Continued financial assistance was given to reactor projects in other nations.

--Training and assistance activities to American States continued. Work continued on the establishment of a Spanish language training center in atomic energy at University of Puerto Rico.

--The United States held its fifth course of the International School of Nuclear Science and Engineering.

--Eighty nations signed the IAEA statute and 59 nations became charter members.

--The European Atomic Energy Community was established.

--The Commission was a cosponsor or supported 10 international conferences in nuclear science and technology.

--The International Atomic Energy Agency was formally inaugurated in Vienna, Austria on October 1.

1958

--President Eisenhower submitted to Congress and asked for early approval of an international agreement with EURATOM for a cooperative program on the peaceful uses of atomic energy.

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--The European Nuclear Energy Agency was officially established February 1, within the framework of the Organization for European Economic Cooperation.

--The Commission announced liberalization of conditions under which uranium enriched to more than 20 percent in U-235 could be made available to friendly nations under agreements for cooperation.

--Letters of commitment for $350,000 each for research reactor projects had been made to 16 countries, nine of them during 1958.

--More than 8.5 kilograms of U-235 were shipped to foreign countries.

--The Second United Nations International Conference on the Peaceful Uses of Atomic Energy was held.

1959

--Exchange visits were made between leading figures in atomic energy activities in the Soviet Union and the United States.

--Discussions continued among the United Kingdom, the United States and the Soviet Union on the cessation of nuclear weapons tests.

--The number of member states of the IAEA increased to 70. General principles of the application of safeguards were provisionally approved by the Board of Governors.

--Closer ties were established with the Organization for European Economic Cooperation.

--Two new agreements for cooperation were signed.

--The Commission established a policy of leasing nuclear material to foreign countries either through the IAEA or agreements for cooperation.

--The Commission established a staff to handle safeguards activities under agreements for cooperation and to assist in the establishment of an effective worldwide safeguards system through the IAEA.

--Training opportunities were expanded for foreign personnel at United States colleges.

--An Inter-American Nuclear Energy Commission was established as a center for consultation and to facilitate cooperation.

1960

--The Fourth General Conference of the IAEA, held in September and October, accepted principles and procedures to serve as the foundation for an international safeguards system against diversion of SNM and equipment from peaceful uses.

--The Joint reactor program of Euratom and the United States entered its second phase with preparation to issue an invitation for proposals for power reactors to be completed by the end of 1965.

--The Commission enlarged its participation in OEEC activities.

--Three new agreements for cooperation became effective.

--Eight new reactors manufactured in the United States went into operation in foreign nations, making a total of 27 reactors in foreign nations. An additional 17 were being built abroad by U.S. companies and seven more were being planned for construction.

--Three additional grants for research reactors were approved, bringing the total number committed since the establishment of the program in 1966 to 22 reactors, with a total value of $7.55 million.

--Commission inspectors conducted safeguards inspections of 33 facilities in 12 foreign countries and the City of West Berlin.

--Commission support of technical libraries continued, bringing to 85 the total number of libraries presented to 58 foreign countries and five international or regional organizations.

--The United States and several agreement nations announced their willingness to transfer to IAEA administration of safeguards for U.S.-supplied nuclear materials.

1961

--The Commission recommended to the President and received approval for increasing the supply of enriched uranium for peaceful uses abroad from 50,000 kilograms to 65,000 kilograms of contained U-235.

--The United States contributed $2.5 million to seven nations to help with nuclear research reactors and equipment.

--The IAEA Board of Governors approved a set of guidelines for Agency safeguards and put them into effect, subject to review after two years.

--The Commission approved the basic United States negotiating position for its offer to place four of its reactor facilities under IAEA safeguards.

--The United States participated in 24 international conferences and sponsored several exhibits.

1962

--U.S.-financed research and development contracts approved by the United States-EURATOM Joint Research and Development Board totaled 34 projects costing $9.57 million.

--The United States signed its first long-term fuel sales contract with EURATOM. (20 years.)

--The State Department convened an Advisory Committee to Review the Policy of the United States toward the IAEA under the chairmanship of Ambassador Henry D. Smyth.

--The first and second tests of IAEA safeguards inspection procedures within the United States were carried out in June and November when two Agency representatives visited U.S. reactors which were made available for this purpose.

--Amendments to 14 U.S. agreements for cooperation were concluded.

--Through 1962, the Commission had made 18 reactor grants, totaling $6.3 million, and had commitments for eight others.

1963

--The United States and India concluded an agreement under which the United States will cooperate in the construction of the Tarapur nuclear power reactor station.

--The United States, Japan, and the IAEA concluded a trilateral agreement under which the Agency assumed responsibility for administering safeguards for U.S.-supplied materials and equipment in Japan. This was the first agreement of this kind.

--The IAEA Board of Governors provisionally approved a system of safeguards for reactors larger than 100 thermal megawatts. This system was endorsed by the Seventh General Conference of the IAEA.

--The first shipment of irradiated reactor fuel was returned from Sweden.

--Through 1965 the Commission made 20 reactor grants totalling $7 million and had commitments for six others to be paid upon completion of the reactors.

--A U.S. delegation toured Soviet peaceful atomic energy installations.

--The Commission program for participation in, and financial support of, selected international conferences on atomic energy included 11 IAEA conferences, 4 sponsored by other international organizations, and 20 held under the auspices of U.S. organizations.

1964

--Through 1964 the Commission distributed abroad special nuclear and other materials with a total value of $117.5 million. Of these, sales accounted for $66.9 million; lease, $31.7 million; and deferred payment arrangements, $18.9 million.

--President Johnson signed into law on August 26, an amendment to the Atomic Energy Act of 1954 providing for private ownership of special nuclear materials.

--Approximately 280 exports and 20 imports of special nuclear materials were made. There were 12 shipments of irradiated fuel elements from research reactors in Sweden and Canada to the United States.

--The IAEA Board of Governors unanimously voted to apply a system of safeguards for reactors with a power rating greater than 100 thermal megawatts.

--Ten trilateral agreements were signed for the IAEA administration of safeguards to replace those previously administered by the United States.

--The Third United Nations International Conference on the Peaceful Uses of Atomic Energy was held.

--The Yankee Atomic Electric Co. reactor at Rowe, Mass. was placed under IAEA safeguards and the first inspection was carried out in November.

1965

--More than 21 of the nations with which the United States had agreements for cooperation agreed to the administration by the IAEA of safeguards over U.S.-supplied nuclear materials and equipment.

--Three power reactors fueled with enriched uranium were contracted for by other countries for a total of 15 power reactors, built, under construction, or planned abroad using U.S.-produced enriched uranium.

--The Committee on the Peaceful Uses of Atomic Energy submitted a report to the White House Conference on International Cooperation.

--The Ninth General Conference of the IAEA gave final approval to a simplified and strengthened safeguards system.

--At the end of 1965, 22 of 26 grants for research reactors made between 1956 and 1962 were made.

--The Commission authorized the formation of a Technical Advisory Panel on Peaceful Use Safeguards to advise the Commission on technical

matters relating to the development and implementation of improved safeguards procedures.

--At the close of 1965 some 30 shipments of spent reactor fuel from abroad had been sent to the Commission's Savannah River Plant and the Idaho Chemical Processing Plant.

--By mid-1965 the Commission had distributed abroad through sale, lease and deferred payment sales, special nuclear and other materials with an approximate value of $141.7 million.

1966

--IAEA safeguards were extended to cover processing plants, a move that was proposed and strongly supported by the United States.

--The United States offered at the eighteen-nation Disarmament Conference in Geneva, in cooperation with Nuclear Fuel Services, Inc., to make the NFS plant for chemical processing of irradiated fuel available to the IAEA to develop and test safeguards techniques and to gain experience and training for Agency safeguards inspectors.

--The Commission issued criteria for the supply of uranium enrichment services to foreign customers. These criteria included: assurance of long-term availability at stable prices of enriched uranium; and non-discriminatory terms and conditions of supply to be as nearly as possible identical between foreign and domestic customers.

--During 1966 there were 21 shipments of spent fuel to the United States for other nations.

--As of mid-1966 the AEC had distributed abroad through sale, lease and deferred payment sales, special nuclear and other materials worth about $214.4 million.

1967

--The 11th General Conference of the IAEA considered the United States' suggestion for the extension of the IAEA safeguards system to fuel fabrication plants.

--The Commission noted the heightened interest in peaceful nuclear energy by Latin American countries.

--President Johnson announced that when safeguards are applied under a nonproliferation treaty for nuclear weapons "...the United States will permit the International Atomic Energy Agency to apply its safeguards to all nuclear activities in the United States--excluding only those with direct national security significance..." (December 2.)

--Two liaison meetings with EURATOM officials were held on safeguards procedures relating to fuel fabrication, especially plants fabricating fuel elements from plutonium and highly enriched uranium.

--The Commission signed its first contract to provide uranium toll enrichment services for a reactor in a foreign country. (Sweden.)

--Thirty-one shipments of spent research reactor fuel were made to the United States for processing.

--As of mid-1967, the AEC had distributed aborad through sale, lease, and deferred payment sales, special nuclear and other materials worth about $266.4 million.

1968

--The Non Proliferation Treaty was opened for signature, 80 nations signed it.

--IAEA safeguards system was extended to cover fuel conversion and fabrication plants.

--The Commission adopted a new policy to deliver enriched uranium as long as five years in advance of the time of actual need.

--As of mid-1968, the Commission had distributed abroad through sale and lease, and deferred payment sales, special nuclear and other materials worth about $313.3 million.

--The Commission negotiated the sale of 850 tons of heavy water, worth $42 million for use in Canada, Germany, and Sweden.

--There were 13 shipments of highly enriched research fuel to the United States for reprocessing.

1969

--Toll enrichment became the preferred method of supplying enriched uranium for reactors abroad.

--Approximately 40 foreign exchange arrangements for information on nuclear science and technology continued.

--A new series of workshops for foreign nationals was held at the Argonne National Laboratory.

--As of mid-1969, the Commission had distributed abroad through sale, lease and deferred payment sales, special nuclear material and other

materials worth about $360.9 million. The sale of 667 tons of heavy water valued at $35.4 million was also negotiated.

--12 shipments of spent fuel were received from foreign countries for reprocessing.

--The United States and the Soviet Union signed their ratified copies of the NPT. (November 24.)

--The United States and the Soviet Union held meetings to discuss their respective peaceful nuclear explosion programs.

1970

--The United States and the Soviet Union deposited their instruments of ratification of the NPT. (March 15.)

--A second set of bilateral meetings was held between representatives of the United States and the Soviet Union to discuss their peaceful nuclear nuclear explosions programs.

--Foreign orders were placed with United States suppliers for nine nuclear powerplants in seven countries.

--By the end of 1970, the Export-Import Bank had authorized 18 projects involving American-supplied materials and equipment in nuclear plants aborad totaling approximately $600 million.

--Export shipments to cooperating countries totaled approximately 3,521 kilograms of U-235 under toll enrichment agreements, 2,597 of U-235 under sale and lease agreements, and 45 kilograms of Pu.

--As of mid-1970 the Commission had distributed abroad through sale, lease, and deferred payment sales, special nuclear material and other materials worth about $437.6 million. The Commission negotiated the sale to Canada of 500 tons of heavy water valued at $29.4 million.

--Ten shipments of spent fuel were received from Canada and Japan for reprocessing in the United States.

1971

--President Nixon announced in his foreign policy report to Congress on Feburary 25, 1971, that the Administration had consulted with the Joint Committee on Atomic Energy concerning ways in which the United States might assist its allies to construct multinational uranium enrichment facilities. The Commission informed several nations that it was prepared to undertake exploratory discussions on the possibility of making gaseous diffusion technology available outside the U.S. Preliminary discussions were held in November.

--Seventeen uranium enrichment contracts were executed under agreements for cooperation.

--Export shipments to agreement nations totaled approximately 19,707 kilograms of U-235 under toll enrichment agreements and 1,264 kilograms of U-235 under sale and lease agreements.

--As of mid-1971, the Commission had distributed abroad through sale, lease, and deferred payment sales, special nuclear material and other materials worth about $572.3 million, resulting in revenues of $491.9 million.

--The United States participated in the Fourth United Nations Conference of the Peaceful Uses of Atomic Energy.

1972

--Forty-one facility inspections were carried out by U.S. personnel in the five countries in which safeguards continue to be applied under agreements for cooperation.

--Meetings were held with other nuclear material and equipment supplier nations to define the extent of their responsibilities under Article III of the NPT.

--In the interest of strengthening international safeguards for nuclear materials, the Commission participated with the IAEA and the U. S. Arms Control and Disarmament Agency in testing prototype safeguards instrumentation.

1973

--The Commission continued to support the objectives of the NPT, including the IAEA's responsibility for administering the treaty's safeguards provisions.

--Discussions continued on the 1967 offer to permit the IAEA to apply its safeguards to all United States nuclear activities, excluding those with direct national security significance.

1974

--The Commission provided technical support to the IAEA for safeguards.

--Negotiations, in which the Commission played a major role, neared completion on a safeguards agreement with the IAEA under which the IAEA will implement safeguards at selected U.S. nuclear facilities.

--The Commission negotiated bilateral information exchange agreements with five nations covering systematic reciprocal exchanges of data on operating experience and other technical informatition related to the safety and environmental impact of nuclear powerplants.

--In mid-1974, the Commission began a small-scale program of assigning a limited number of foreign regulatory employees from countries with embryonic nuclear power programs to work for one to two years within the AEC regulatory organization.

APPENDIX IV

PRINCIPLES FOR ESTABLISHING THE SAFEGUARDS AND CONTROL SYSTEM UNDER THE EURATOM AGREEMENT

The principles which will govern the establishment and operation of the safeguards and control system are as follows:

The EURATOM Commission will:

1. Examine the design of equipment, devices and facilities, including nuclear reactors, and approve it for ~~the purpose~~ of assuring that it will not further any military purpose and that it will permit the effective application of safeguards, if such equipment, devices and facilities:

(a) are made available pursuant to this Agreement; or

(b) use, process or fabricate any of the following materials received from the United States: source or special nuclear material, moderator material or any other material relevant to the effective application of safeguards; or

(c) use any special nuclear material produced as the result of the use of equipment or material referred to in subparagraphs (a) and (b).

2. Require the maintenance and production of operating records to assure accountability for source or special nuclear material made available, or source or special nuclear material used, recovered, or produced as a result of the use of source or special nuclear material, moderator material or any other material relevant to the effective application of safeguards, or as a result of equipment, devices and facilities made available pursuant to this Agreement.

3. Require that progress reports be prepared and delivered to the EURATOM Commission with respect to projects utilizing material, equipment, devices and facilities referred to in paragraph 2 of this Annex.

4. Establish and require the deposit and storage, under continuing safeguards, in EURATOM facilities of any special nuclear material referred to in paragraph 2 of this Annex which is not currently being utilized for peaceful purposes in the Community or otherwise transferred as provided in the Agreement for Cooperation between the Government of the United States of America and the Community.

5. Establish an inspection organization which will have access at all times:

(a) to all places and data, and

(b) to any person who by reason of his occupation deals with materials, equipment, devices or facilities safeguarded under this Agreement,

necessary to assure accounting for source or special nuclear material subject to paragraph 2 of this Annex and to determine whether there is compliance with the guarantees of the Community. The inspection organization will also be in a position to make and will

make such independent measurements as are necessary to assure compliance with the provisions of this Annex and the Agreement for Cooperation.

It is the understanding of the Parties that the above principles applicable to the establishment of the Community's inspection and control system are compatible with and are based on Article XII of the Statute of the International Atomic Energy Agency,[1] Chapter VII of Title Two of the Treaty establishing the European Atomic Energy Community, and those adopted by the Government of the United States of America in its comprehensive Agreements for Cooperation.

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