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A study of the peaceful nuclear export policies of major foreign supplier nations indicated that the United States faces increased competition from foreign suppliers. The United States and other supplier nations have reassessed their nuclear export programs and established the Nuclear Suppliers Group. Member nations have adopted some principles as a matter of national policy of future nuclear exports. There are no required international standards for the physical protection of nuclear material and equipment, and although foreign suppliers have procedures for regulating nuclear exports, in most cases they have no independent regulatory agencies similar to the U.S. Nuclear Regulatory Commission. Findings/Conclusions: In recent years, the U.S. share of the available nuclear export market has decreased markedly. U.S. suppliers received 85% of such orders through 1972, but during the next 3 years the U.S. share dropped to 42%. France and West Germany are the leading foreign suppliers of light-water reactors. Japan has a strong domestic nuclear industry and the potential to become an important nuclear exporter. Canada exports heavy-water reactors, heavy water, and uranium. The British have been much more successful in the field of nuclear fuel services than in the export of reactors. Among the principles adopted by nations comprising the Nuclear Suppliers Group are: to apply International Atomic Energy Agency safeguards to exports; to prohibit recipients using assistance for any nuclear explosions; to require physical security measures by recipients on nuclear equipment and materials; to encourage multinational regional facilities for reprocessing and enrichment; and to take special care in the use

or retransfer of sensitive material, equipment, and technology. (SW)

STUDY BY THE STAFF OF THE U.S. GENERAL ACCOUNTING OFFICE

Overview Of Nuclear Export Policies Of Major Foreign Supplier Nations

The United States faces increased competition from foreign nuclear suppliers, including West Germany, France, the United Kingdom, Canada, and, possibly, in the near future, Japan. This general overview shows the differences and similarities in foreign nuclear supplier export requirements. It is based on summaries furnished by the Department of State covering the nuclear export policies and procedures of the major foreign supplier nations.

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OCTOBER 21, 1977

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

INTERNATIONAL DIVISION

PREFACE

This study of the peaceful nuclear export policies of major foreign supplier nations was made with the view that it would be helpful in considering actions to curb further nuclear weapons proliferation. Although we were able to develop general information on foreign atomic energy programs, inquiries at the Department of State, Energy Research and Development Administration, Nuclear Regulatory Commission, and Export-Import Bank of the United States, showed that much of the detail information on the policies of foreign supplier countries was not readily available in Washington.

State Department officials requested that we conduct our study without contacting foreign groups or governments because international nuclear export policy talks were entering an especially intense and critical phase. They believed that any contacts outside of established diplomatic channels during this period could be misunderstood and complicate the U.S. negotiating task. It was proposed that we submit specific inquiries to the Department which would supply available data from U.S. sources and do its best to obtain other desired information from foreign governments as necessary and appropriate.

In response to our specific request, the State Department furnished summaries of the peaceful atomic energy activities of West Germany, France, the United Kingdom, Canada, and Japan, as developed by the U.S. Embassies. (See apps. I through V.) These summaries serve as the basis for our comparison of U.S. and foreign nuclear export policies and procedures. Because of the sensitivity of this issue, we did not verify the accuracy and completeness of the information contained in the summaries.

This general overview of the differences and similarities of the policies and procedures of major nuclear suppliers may be useful to the executive agencies and

congressional committees dealing with U.S. nuclear policy. Therefore, we are sending copies to the Secretaries of State and Energy; Chairman of the Nuclear Regulatory Commission; Director of the Arms Control and Disarmament Agency; and Chairmen of the Senate Committees on Foreign Relations and Governmental Affairs and the House Committee on International Relations.

Charles D. Ellyson
for
Director

Contents

		Page
SUMMARY		1
CHAPTER		
1	NUCLEAR PROGRAMS IN FOREIGN SUPPLIER NATIONS	3
	Organizational responsibilities	3
	Export activities	4
	Uranium enrichment technology	6
	Reprocessing technology	7
	Fast breeder reactor technology	7
2	STATUTORY AND REGULATORY REQUIREMENTS IMPOSED ON NUCLEAR EXPORTS	9
	Statutory requirements and agreements for cooperation	9
	Regulatory and licensing functions	11
	Retransfers of nuclear material, equipment, and technology	12
3	INTERNATIONAL NUCLEAR SAFEGUARDS AND PHYSICAL SECURITY	14
	International safeguards	14
	Physical security	16
4	PEACEFUL NUCLEAR EXPORT FINANCING	18
APPENDIX		
I	Peaceful Nuclear Export Policies of the Federal Republic of Germany	20
II	Peaceful Nuclear Export Policies of the Government of France	29
III	Peaceful Nuclear Export Policies of the United Kingdom	40
IV	Peaceful Nuclear Export Policies of the Government of Canada	47
V	Peaceful Nuclear Export Policies of the Government of Japan	54

ABBREVIATIONS

AECL	Atomic Energy Agency of Canada Limited
BFCE	Bangue Francaise du Commerce Exterieur
CEA	Commissariat a L'Energi Atomique
COFACE	Compagnie Francaise d'Assurance pour le Commerce Exterieur
ERDA	Energy Research and Development Administration
EURATOM	European Atomic Energy Community
GAO	General Accounting Office
IAEA	International Atomic Energy Agency
KFW	Kreditanstalt fuer Wiederaufban
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NRC	Nuclear Regulatory Commission
UKAEA	United Kingdom Atomic Energy Authority

SUMMARY

The United States no longer has a monopoly on the supply of nuclear material, equipment, and technology. Other nations have developed the capability to compete in the expanding worldwide commercialization of nuclear power. In recent years the U.S. share of the available nuclear export market has decreased markedly. According to the nuclear industry, U.S. suppliers received 85 percent of such orders through 1972 but during the next 3 years the U.S. share dropped to 42 percent.

The United States has been the world's dominant supplier of enriched uranium services. But in 1974 it had to suspend the signing of long-term enrichment contracts because of its limited enrichment capacity. Other nations and groups of nations continued to develop their own enrichment capability, and although the administration is proposing to reopen the order books for enrichment services, as these nations bring their own commercial-size enrichment plants online, the U.S. share of the international market could be reduced.

In recent years there has been a growing worldwide awareness of the inherent risks to world security posed by the continued expansion of peaceful nuclear technology. Following India's test in 1974, the United States and other supplier nations reassessed their nuclear export programs and established the Nuclear Suppliers Group. 1/ The principles adopted by the member nations as a matter of national policy on future nuclear exports include:

--Provisions for applying International Atomic Energy Agency safeguards to exports of material, equipment, and technology.

--Prohibitions against recipients using assistance for any nuclear explosions, including those for "peaceful purposes."

--Requirements for physical security measures by recipients on nuclear equipment and materials.

1/ Group of countries originally consisting of the United States and six other nuclear suppliers who, in January 1976, notified one another of their intentions to unilaterally follow certain common nuclear export policies. Eight other nations subsequently have joined.

--Application of restraint in transferring sensitive technologies, such as enrichment and reprocessing.

--Encouragement of multinational regional facilities for reprocessing and enrichment.

--Special conditions governing the use or retransfer of sensitive material, equipment, and technology.

The Group's discussions about strengthening international safeguards, physical security, and controls over sensitive technologies are an important step in the development of more stringent international nuclear export policies. However, the guidelines agreed to are only a framework for international nuclear cooperation, and individual countries are free to establish and implement their international nuclear programs within this framework.

Knowing what requirements other supplier countries place on their nuclear exports can be very helpful in the reassessment of U.S. non-proliferation precautions. Thus, the following chapters contain information on the suppliers' nuclear export programs and the specific nuclear export policies and procedures, laws, regulations, and international agreements governing each supplier's international peaceful nuclear cooperation activities.

CHAPTER 1

NUCLEAR PROGRAMS IN FOREIGN SUPPLIER NATIONS

For years, foreign government interests in atomic energy have focused primarily on developing strong domestic nuclear energy programs. Recently, however, a number of foreign countries have developed nuclear energy to the point where they are now exporters of nuclear commodities, including light-water and heavy-water reactors. Enriched uranium fuel is also becoming available from foreign sources as countries develop indigenous enrichment capabilities using gaseous diffusion and the new gas centrifuge technologies. Additionally, breeder reactor research outside the United States is continuing to move ahead, which could provide an advantage in the ultimate commercialization of such reactors. To put these foreign activities in better perspective, the following sections present a broad overview of the domestic and international nuclear programs in West Germany, France, the United Kingdom, Canada, and Japan.

ORGANIZATIONAL RESPONSIBILITIES

Atomic energy activities in the supplier nations are carried out through the interrelationship of various departments and agencies established by the central governments. France's Commissariat a L'Energi Atomique (CEA), the United Kingdom Atomic Energy Authority (UKAEA), and the Atomic Energy Agency of Canada Limited (AECL), which are similar to the former U.S. Atomic Energy Commission, have been established to coordinate nuclear research and development activities in their respective countries. West Germany does not have a national atomic energy agency, and its Ministry for Research and Technology is responsible for nuclear energy research and development. In Japan, nuclear research and development activities are carried out by five semi-governmental organizations which receive their funding from the government and private sources.

The West German Ministry of Economic Affairs is responsible for issuing nuclear export licenses, and customs authorities under the Ministry of Finance enforce the license requirements. In France, export permits are issued by the Ministry of Finance after consultations with other government agencies, including the CEA. All Canadian export permits are granted by the Department of Industry, Trade and Commerce; however, nuclear export

permits are issued only with the concurrence of the Atomic Energy Control Board. The Department of Trade in the United Kingdom is responsible for export controls imposed on nuclear-related equipment and materials. Japan, on the other hand, is not now a significant nuclear exporter, and has no specific regulatory and licensing criteria for this type of export.

EXPORT ACTIVITIES

Atomic energy export competition is most intense for equipment comprising the basic nuclear reactor plant. Countries producing nuclear fuel in excess of their needs--fuel available for export--are few. However, this could change as foreign enrichment plants come online.

France and West Germany are the leading foreign suppliers of light-water reactors. France's first reactor export went to Belgium in 1969. In 1974, Belgium ordered two additional reactors, and in 1976 South Africa ordered two units and Iran submitted a Letter of Intent to purchase two. Future French program plans call for selling two to four nuclear reactors a year to other countries. Framatome, the primary light-water reactor manufacturer in France, achieved its technological and production capabilities through licensing arrangements with a U.S. company.

In 1976, France became involved in a controversial deal with Pakistan to supply nuclear reactors and a reprocessing plant for separating plutonium from the used reactor fuel. The United States has strongly protested this arrangement because the size of the Pakistan nuclear program does not justify a reprocessing plant and the sale would provide the potential for another country to develop atomic weapons. Although the French have officially stated they would not cancel their deal with Pakistan, there have been signs that France is slowing delivery of essential plans for the construction of the reprocessing plant. Since the contract with Pakistan was signed, the French Government has established a new policy barring any more such sales.

West Germany has exported 10 reactors to date. General data on total 1974 West German nuclear exports indicate their value at approximately $70 million, about $44 million of it for reactors, fuel elements, and source and fissionable materials. Source and fissionable materials exports go primarily to common market countries

through the European Atomic Energy Community (EURATOM).1/ The dominant reactor manufacturer is the Kraftwerk Union, which builds reactors for domestic use as well as for export.

There is little data on other West German nuclear exports except for the Brazilian deal which has a potential value of $4 billion. Strong protests were raised by the United States over this deal because the contract includes sensitive enrichment and reprocessing technologies. In June 1977, West Germany issued a statement, similar to the French statement after the Pakistan deal, to the effect that future exports of controversial nuclear technology which could be used to make atomic weapons would be halted. However, the West German statement reaffirmed the decision to fulfill the existing contract with Brazil.

Canada's nuclear industry depends on the export of CANDU (heavy-water) reactors, heavy water, and uranium to maintain its competitiveness in the international nuclear trade market. Although figures are not readily available on CANDU reactor sales, the U.S. Department of State estimates that such sales will approximate $200 million annually from 1976 through 1981. Canada also exports about 5,000 to 7,000 tons of uranium concentrate a year.

Except for small research and training reactors, the United Kingdom has been unable to break into the commercial export market dominated by the United States, West Germany, and other countries which adhere to light-water reactor designs. The British have been much more successful in the field of nuclear fuel services, such as uranium enrichment and reprocessing, as carried out by British Nuclear Fuels Limited, a commercial offshoot of the UKAEA.

Up to the present time, Japan's nuclear exports have consisted of radioisotopes for medical and diagnostic purposes and nuclear equipment for industrial use. Its first potential major nuclear export may be light-water reactor components for the Soviet Union. Japan has a strong domestic nuclear industry and the potential to become an important nuclear exporter.

1/ Composed of Belgium, Denmark, France, West Germany, Ireland, Italy, Luxembourg, the Netherlands, and the United Kingdom, and established in 1957 to "create conditions necessary for the speedy establishment and growth of nuclear industries" in member countries.

URANIUM ENRICHMENT TECHNOLOGY

The European suppliers and Japan have agreed to exercise restraint in future exports of uranium enrichment technology, but several are moving ahead with plans to enhance their own enrichment capability. Canada is not in the business of enriching uranium.

France has an extensive uranium enrichment construction program underway which provides for partial foreign ownership in return for a proportional share of the production of the facility. Initial production of 2.3 million separative work units 1/ is scheduled for 1979 from EURODIF I 2/ which will have an estimated annual capacity of 10.7 million separative work units by 1982. EURODIF II, 3/ with an expected 5 million separative work units capacity, will begin initial production in 1984.

West Germany, the United Kingdom, and the Netherlands, participate in URENCO, a centrifuge enrichment organization which has two pilot plants operating in the Netherlands and one in the United Kingdom. Current enrichment capacity for these plants totals about 75,000 separative work units. The United Kingdom also operates a diffusion enrichment plant at Capenhurst for its nuclear power program.

Japan is also seeking to diversify its source of supply for enriched uranium through the development of a centrifuge enrichment process. Two small centrifuge test facilities are already operational and are providing operating data necessary to construct a pilot centrifuge enrichment plant scheduled for completion in the early 1980s. A full-scale production facility is expected to supply a significant portion of Japan's enriched uranium requirements in the 1990s.

1/ Measurement of the efforts required to separate uranium into a product containing the desired concentration of the isotope U-235.

2/ EURODIF I, a joint venture of France, Italy, Belgium, Spain, and Iran, is building a gaseous diffusion enrichment plant in France.

3/ EURODIF II is a joint venture of EURODIF I, (which has a majority ownership), France and Iran.

REPROCESSING TECHNOLOGY

The only commercial reprocessing plant in the world for light-water reactor fuel is a small facility located in La Hague, France. However, the weapons countries all have noncommercial reprocessing plants and several countries reprocess spent fuel from other types of reactors. The La Hague plant is under the auspices of United Reprocessors, a company composed of France, West Germany, and the United Kingdom, which reprocesses spent reactor fuel on a commercial basis. Reprocessing capacity at La Hague will reach 400 tons per year in 1978; 800 tons per year by 1981; and, after planned expansion, 1,500 tons per year by early 1990.

At its Windscale facility, the United Kingdom has operated a plant to reprocess natural uranium fuel since 1964. However, its reprocessing plant for light-water reactor type fuel operated only from 1972 to 1973. Plans for a new commercial reprocessing facility for use in the 1980s are currently a subject of public debate; however, design and development work is proceeding.

The West German pilot reprocessing plant at Karlsrhue has a capacity of about 40 tons a year and additional capacity is expected to be completed by 1985. Japan's first reprocessing plant, with a capacity of 210 tons a year, has been built by French and Japanese firms and is scheduled to begin operating in 1977. Because of the limited capacity of this plant, Japan plans to construct a second nuclear fuel reprocessing plant with a capacity of 1,500 tons a year to begin operating around 1985.

Japan's plans to begin reprocessing operations initially encountered problems as a result of President Carter's position opposing reprocessing for the immediate future. A joint U.S.-Japanese team of scientists was tasked to study the situation. It has been recently reported that under a tentative agreement, Japan would be permitted to reprocess U.S.-supplied spent fuel for 2 years. To date, specific details on the agreement have not been announced.

FAST BREEDER REACTOR TECHNOLOGY

Despite opposition by the United States to the commercial development of plutonium-fueled fast breeder reactors, there has been little indication that other countries heavily involved in breeder research and

development are pulling back. In fact, it was reported that France, West Germany, and three other European nations recently signed a series of accords for joint research and marketing of fast breeder reactors.

The French breeder research and development program is the largest single program in the CEA's civil sector, overshadowing even the French uranium enrichment program. The breeder program has been organized into three construction stages--the experimental Rapsodie reactor which began operation in 1967, the demonstration Phenix reactor which was brought to full power in 1974, and the commercial-size Super Phenix which the French hope to complete by 1979.

The fast breeder reactor is also important in West Germany's nuclear power program. The German fast breeder project was started in 1960 and currently centers around the construction of a 300-megawatt prototype breeder reactor, the SNR-300, which is jointly financed with Belgium and the Netherlands (15 percent each). Construction of this reactor started in early 1973 and is expected to be completed in 1980, with full power operation in 1981.

Other suppliers, except Canada which does not now reprocess spent fuel, are conducting extensive fast breeder reactor research and development programs. The United Kingdom has completed construction of an intermediate-size demonstration reactor and a full-scale demonstration unit is scheduled to begin operating in 1984 or 1985. Fully commercial breeders are not expected until the late 1980s, at the earliest. Also, to meet increasing energy requirements, Japan is developing a fast breeder reactor which is scheduled for introduction on a commercial basis in the late 1980s.

CHAPTER 2

STATUTORY AND REGULATORY REQUIREMENTS IMPOSED ON NUCLEAR EXPORTS

Peaceful nuclear cooperative activities of the major foreign supplier nations are generally carried out within statutory frameworks similar to the U.S. Atomic Energy Act of 1954, as amended (42 U.S.C. 2011). Foreign suppliers also have established procedures for regulating or controlling nuclear exports although, in most cases, they have no independent regulatory agencies similar to the U.S. Nuclear Regulatory Commission.

STATUTORY REQUIREMENTS AND AGREEMENTS FOR COOPERATION

The basis for U.S. participation in an international nuclear cooperative program is the Atomic Energy Act of 1954, as amended. The act authorizes the United States to enter into agreements for cooperation in the civil uses of atomic energy with other nations to share the peaceful benefits of nuclear energy. In return for U.S. cooperation, each nation or group of nations guarantees that U.S. assistance will not be used for nuclear weapons development.

The Energy Reorganization Act of 1974 (Public Law 93-438), abolished the Atomic Energy Commission and transferred its licensing and regulatory functions to the newly created, independent Nuclear Regulatory Commission (NRC), including licensing for peaceful nuclear exports. NRC must now decide whether an export would be detrimental to the common defense and security of the United States.

All foreign nuclear suppliers, through various laws, decrees, ordinances, or circulars, have established statutory frameworks governing nuclear cooperation with recipient nations. These countries generally use formal agreements to identify the parameters and responsibilities of cooperation with other countries.

West Germany has many general agreements providing for international scientific and technological cooperation which, in many cases, would permit nuclear cooperation under specific agreements negotiated separately. Typically, West Germany would require a specific agreement for cooperation before authorizing the export of

significant nuclear material, equipment, and technology. At the present time, outside the Common Market 1/, such agreements exist only with Brazil and Iran.

France currently has bilateral agreements with 13 individual nations. In practice, it requires bilateral agreements covering safeguards and conditions for the sale of nuclear material and sensitive technologies. According to the U.S. Department of State, these agreements appear to be fully compatible with the export policy guidelines of the Nuclear Suppliers Group.

The United Kingdom generally conducts its international nuclear cooperation without entering into formal agreements. One exception noted in our analysis of information furnished by the Department of State was an agreement with Romania which was necessary to satisfy Romania's domestic requirements. However, we are also aware of agreements the United Kingdom has with the United States and Japan.

Canada does not provide any nuclear material, equipment, or technology without a peaceful uses agreement. It currently has agreements with 14 individual nations, the International Atomic Energy Agency (IAEA), 2/ and EURATOM. Bilateral agreements include assurances that the recipient will not divert material for any nuclear explosive device and stipulate sanctions for non-compliance, such as the suspension of nuclear cooperation and the return of Canadian-supplied nuclear commodities. In addition, under new agreements a recipient of Canadian nuclear cooperation must be a Non-Proliferation Treaty signatory or accept international safeguards on its entire peaceful nuclear program.

1/ Officially named the European Economic Community, the Common Market is an economic association established in 1958, and was originally composed of Belgium, France, Italy, Luxembourg, the Netherlands, and West Germany.

2/ IAEA, composed of 109 member nations, is an autonomous intergovernmental organization under the aegis of the United Nations. It is recognized as the agency responsible for international peaceful uses of atomic energy.

Japan has nuclear agreements with the United States, Australia, France, Canada, and the United Kingdom which are written as mutually applicable to each signatory country. Although there is a definite supplier-customer relationship with Japan on the receiving end, reciprocity provisions are included.

REGULATORY AND LICENSING FUNCTIONS

The Nuclear Regulatory Commission controls U.S. nuclear exports through a system of export licenses. However, the Department of Commerce also licenses certain nuclear exports and the Energy Research and Development Administration (ERDA)1/ authorizes the export of civilian nuclear power reactor technology and assistance.

NRC's statutory authority for nuclear exports is derived from the Atomic Energy Act of 1954 as amended and the Energy Reorganization Act of 1974. NRC licenses natural and enriched uranium, plutonium, radioactive by-products, and reactors or facilities designed to produce enriched uranium or plutonium. However, in weighing licensing decisions, NRC relies heavily on information provided by the executive branch concerning foreign policy and defense and security implications of the exports.

The statutory authority of the Department of Commerce is the Export Administration Act of 1969, as amended. Commerce currently licenses about 100 items identified by the former Atomic Energy Commission as being of special strategic nuclear interest, including specially designed components of nuclear reactors. Commerce receives policy direction from ERDA on the 100 items and does not issue a license without ERDA concurrence. The NRC also advises Commerce on specially designed reactor components on the 100-item list.

The four major foreign supplier nations also require licenses or permits for certain nuclear material and equipment they export. However, it appears that Canada is the only supplier country which has an organization comparable to NRC, its Atomic Energy Control Board, responsible for licensing and regulating nuclear exports. Additionally, there appears to be no division of responsibility in the foreign systems for licensing essentially complete nuclear facilities, or components of such facilities, as the licensing organizations are responsible for both types of exports.

1/ On October 1, 1977, the new Department of Energy assumed the responsibilities of ERDA.

Intragovernmental coordination on nuclear export license applications in the four supplier countries is also characteristic of the U.S. program. In all cases, the government organization responsible for export licensing receives policy direction or consults with other government departments and agencies as part of the licensing process. In no case does a single government body have sole authority or control over nuclear exports.

RETRANSFERS OF NUCLEAR MATERIAL, EQUIPMENT, AND TECHNOLOGY

Under a typical U.S. agreement for cooperation, U.S.-supplied nuclear material and equipment or nuclear material produced through the use of such items may not be transferred to unauthorized persons or retransferred from one agreement to another without prior U.S. approval. Under current U.S. export policies, ERDA, in consultation with State, NRC, and the Arms Control and Disarmament Agency, approves requests to retransfer U.S.-supplied nuclear exports provided through NRC license or ERDA authorization. Reexports of nuclear-related commodities initially licensed by the Department of Commerce require the approval of Commerce.

Retransfers must be within the scope of an agreement for cooperation between the United States and the party receiving the nuclear material. Controls to assure that foreign nations do not retransfer U.S.-supplied nuclear material and equipment without U.S. approval are limited. The United States must rely primarily on international safeguards accountability inspections and the good faith of the foreign recipient.

France, the United Kingdom, and West Germany, in line with Nuclear Suppliers Group guidelines, have established similar requirements governing retransfers. Controls applied by these suppliers permit retransfers of non-sensitive nuclear material and equipment without prior approval as long as the recipient of the retransfer has provided the same assurances given by the original customer, including acceptance of safeguards, non-explosive use, and physical protection. Retransfers of sensitive material, equipment, and technology may only be made with the consent of the supplier nations.

Canada, the United Kingdom, and West Germany have incorporated provisions on retransfers into their agreements for cooperation with other countries. All Canadian

bilateral agreements since 1974, and some prior to this date, prohibit the retransfer of Canadian-supplied nuclear materials and equipment. United Kingdom agreements provide for retransfers to be handled "in accordance with the international obligations of each of the contracting parties under conditions to be agreed upon in each particular case." West Germany has incorporated retransfer provisions in its agreement with Brazil.

Information is sketchy on the controls that foreign suppliers have instituted to assure compliance with retransfer requirements. Canadian bilateral agreements call for immediate and full consultations when consent to retransfer is not granted. In addition, as part of its export control program, Canada appears to be the only supplier in the group that requires the original export and any retransfers be approved by the same governmental agency--the Atomic Energy Control Board. West Germany relies on the International Atomic Energy Agency safeguards system to detect violations and unauthorized transfers. Information was not provided on United Kingdom procedures for approving retransfers.

CHAPTER 3

INTERNATIONAL NUCLEAR SAFEGUARDS AND PHYSICAL SECURITY

As the number of countries having access to peaceful nuclear materials, equipment, and technology increases, greater reliance will be placed on international safeguards systems to assure that cooperative activities in nuclear energy do not lead to nuclear weapons capability. Similarly, terrorist acts in recent years emphasize the importance of protecting sensitive nuclear material from attempted diversion by subnational groups and preventing the sabotage of nuclear facilities. At the present time, the responsibility for international safeguards in most countries rests primarily with the IAEA. However, the physical protection of nuclear material and equipment historically has been the responsibility of individual sovereign countries. Although efforts are being made to upgrade physical security, there are no required international standards for the physical protection of nuclear material and equipment.

INTERNATIONAL SAFEGUARDS

Since 1955 the United States has required that all U.S. nuclear exports supplied under agreements for cooperation be used only for peaceful purposes. To insure such use, the United States included a provision which gives it the right to verify these peaceful uses through a review of transfer records and reports and through onsite safeguards inspection.

As IAEA developed, the United States recognized the advantages of having the Agency apply safeguards to U.S. exports of nuclear material and equipment. As a result, over the years the United States has transferred the safeguards functions of most U.S. bilateral cooperation agreements to the IAEA. U.S. safeguards rights are now suspended as long as IAEA safeguards are applied. However, the wording of some agreements reserving U.S. rights raises questions of when the United States could or would reinstate its own safeguards and whether such safeguards rights extend beyond the expiration dates of the agreements.

Although the United States has encouraged countries who are not members of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) to become parties to the Treaty, it currently does not require a country to be party to the

NPT or accept safeguards on its entire peaceful program as a precondition for receiving U.S. nuclear cooperation. At the present time, the United States cooperates with 10 non-NPT countries and is negotiating new agreements with such non-NPT countries as Egypt and Israel.

The major foreign nuclear suppliers are all IAEA members and over the years have actively supported and participated in Agency safeguards activities. West Germany, France, the United Kingdom, and Canada require IAEA safeguards on nuclear material and equipment provided to recipient nations outside the European Community. Exports within the European Community are subject to the EURATOM safeguards system. Since the end of 1976, Canada has gone a step further and requires non-nuclear weapons states to accept international safeguards on their entire peaceful program as a mandatory condition of supply. To date, Canada is the only nuclear supplier to impose such a condition on its nuclear cooperation.

From the information provided by the Department of State it appears that foreign suppliers, except Canada, have no bilateral safeguards inspection programs and have no specific provisions in their agreements for residual safeguards rights in the event IAEA safeguards can no longer be effectively applied. Residual safeguards rights are provided for in Canadian bilateral agreements. In addition, Canada has carried out bilateral inspections in such countries as France, West Germany, Switzerland, Italy, and the United Kingdom prior to export of Canadian-origin materials.

The French bilateral agreement with South Africa requires that should the recipient partner withdraw from NPT--assuming that South Africa becomes a party to the Treaty--IAEA safeguards or their equivalent will continue in force. Neither the West German-Brazil bilateral agreement, characterized by West Germany as a good example of an appropriate arrangement for a non-NPT recipient, nor the West German-Brazil-IAEA trilateral safeguards agreement reserves to West Germany any residual safeguards rights.

On the question of whether safeguards extend beyond the expiration dates of the agreements, West Germany's agreement with Brazil provides that safeguards obligations will not be affected by the termination of the agreement. In the French bilateral agreement with South Africa, the length of time for safeguards coverage includes reference

to the sensitive life of the nuclear material and/or technologies supplied. Safeguards coverage in Canadian agreements negotiated since 1974 cover the entire life of Canadian-supplied nuclear material, facilities, equipment, and all subsequent fissile material produced.

Little information was provided on the safeguards requirements of the United Kingdom and Japan. The United Kingdom requires the application of IAEA safeguards, or comparable safeguards verified by the IAEA, on its exported nuclear material and equipment. Japan, which is in the process of formulating its nuclear export policies and procedures, including those relating to safeguards, takes the position that as long as nuclear material remains in a receiving country, the covering safeguards agreement cannot expire.

PHYSICAL SECURITY

Historically, the physical security of nuclear materials and equipment has been the responsibility of individual sovereign countries. However, over the past several years, the physical protection of nuclear material and equipment has received increased attention. This awareness has led supplier nations to agree to common policies requiring recipients of nuclear exports to meet stringent physical security standards.

The United States, realizing the importance of adequate physical security systems, revised its policy in 1974 and requires foreign countries to implement physical security arrangements acceptable to the United States prior to the export of significant quantities of plutonium and highly enriched uranium. New policy initiatives were required because current agreements for cooperation do not specifically provide for U.S. rights to verify the adequacy of foreign physical security. As a result of this policy, ERDA and NRC officials, prior to the export of such nuclear material, review a nation's physical security through discussions with foreign atomic energy representatives and through onsite inspections.

The physical security requirements of West Germany, France, the United Kingdom, and Canada are apparently in line with the Nuclear Suppliers Group guidelines requiring recipients of their nuclear material and equipment to implement adequate physical security measures on such exported products. It appears that Canada is the only foreign supplier that conducts physical security reviews

incountry prior to exporting nuclear commodities to determine that the protection will be adequate. Additionally, Canada specifically provides for periodic consultations and review rights on physical security in its peaceful nuclear agreements with recipient nations.

West Germany's current position, based on the recent German-Brazilian agreement, is that the supplier and recipient country should agree on the "level" of physical security required. Specific "measures" consistent with the required level must be the responsibility of the recipient country. France, in its agreement with South Africa, for example, requires the recipient to take adequate physical security measures. However, there are no provisions for France to make prior inspections or to be continually advised of the state of South African physical security measures.

CHAPTER 4

PEACEFUL NUCLEAR EXPORT FINANCING

The Export-Import Bank of the United States (Eximbank), an independent corporate agency, supports a broad range of U.S. exports in keeping with its legislative mandate to facilitate the export of U.S. goods and services. To date, Eximbank has been the largest U.S. Government source of financing for foreign nuclear energy projects, through direct financing and commercial and political risk insurance and guarantees. Although U.S. nuclear equipment may be fully competitive in price, quality, service, and delivery, sales may be lost unless adequate financing is available. It is Eximbank's view that private capital markets should be relied upon to the fullest extent possible to finance U.S. exports; however, according to an Eximbank official, there are a number of export sectors, including the nuclear sector, where private export credit is not available in sufficient volume and on appropriate terms.

Providing financial support for the export of nuclear goods and services is not unique to the United States. The West German policy for financial support of nuclear exports is that commercial sources should provide the funding required. However, based on particular circumstances, official assistance may be provided by Hermes Kreditversicherungs (Hermes), a private firm acting on behalf of the government, through financial guarantee or insuring of commercial financing or by the Kreditanstalt fuer Wiederaufban (KFW) through a financial guarantee or direct credit. To date only three of the eight West German nuclear exports (to Brazil, Argentina, and Spain) have received official financing assistance. Nuclear sales to developed countries and to Iran have been handled on a purely commercial basis.

Assessment of the economic and technical feasibility of nuclear sales is customarily performed by the selling firm in West Germany. Relevant studies are then submitted to Hermes, which in the case of nuclear exports, would make the final decision on whether official financial assistance is warranted. Terms and interest rates are normally determined by conditions in the private financial markets where the funds are obtained. According to

Department of State information, a direct credit from KFW would carry an interest rate of 8 percent with a maturity of up to 12 years. In most cases involving official financial assistance, financial policies are in total accord with national policies.

French financial support for exports is provided through long-term credits of the Banque Francaise du Commerce Exterieur (BFCE) and the Bank of France. In addition, Compagnie Francaise d'Assurance pour le Commerce Exterieur (COFACE) administers the insurance and guarantee program. Both BFCE and COFACE, joint stock companies with a quasi-public status, conduct their business as commercial operations.

According to State Department officials, little is published regarding specific French policies and practices for financing nuclear exports. U.S. officials believe that the normal provisions of the Ministry of Finance for general exports also cover nuclear exports and that terms and rates of loans are more severe than those of Eximbank. Additionally, in the past, French reactor sales have been part of an overall government-to-government cooperative program and have included barter arrangements as well as financial assistance.

Canada's official export credit and insurance program is administered by the Export Development Corporation, a Canadian Crown corporation. Under Canadian policy, each new application for a reactor sale must be approved by the full cabinet. Once approved, the first choices for financing would be private sources in Canada or recipient government financing. Otherwise, nuclear exports are financed through the Export Development Corporation, which maintains close coordination with Eximbank on terms and conditions for financing.

The United Kingdom has no policy laid down on nuclear export financing, and each export case is examined on its own merits. Overall official export credit and insurance systems are administered by the Export Credits Guarantee Department, an executive agency of the British Government.

Nuclear exports from Japan have been of very little consequence, therefore, no firm policy has been adopted on financing large equipment exports. It is expected, however, that Japan would finance up to 80 percent of such exports. Currently, the Export-Import Bank of Japan and Ministry of International Trade and Industry administer the Japanese export import system.

PEACEFUL NUCLEAR EXPORT POLICIES OF THE FEDERAL REPUBLIC OF GERMANY

Summary and Introduction

The FRG has ratified the NPT and participates actively in the work of the Nuclear Suppliers' Group (NSG) and in COCOM. FRG nuclear export policy is strongly influenced by the obligations so established. German authorities and nuclear industrialists consider nuclear exports essential for the economic well-being of the nation as a net exporter of high technologies. International cooperation in general scientific and technological affairs has served as a basis for commercially motivated exports of nuclear power plants and other nuclear technologies. The FRG conducts research to improve international safeguards and cooperates in relevant programs of EURATOM and the IAEA. Consequently, in general, the FRG would not implement nuclear safeguards and control measures in a recipient country on a bilateral basis.

SOURCE: Department of State

GAO note: Attachments to these five summaries are not included since they are not essential to understanding the overview.

APPENDIX I

BACKGROUND ON NUCLEAR ACTIVITIES

Overview: Nuclear Energy Research and Development and Demonstration are the responsibility of the FRG Ministry for research and technology (BMFT), which promotes and supports the development of advanced nuclear power reactor systems such as the liquid metal cooled fast breeder and the gas cooled high temperature concepts. The FRG Ministry of Economic Affairs has strong influence in the industrial area; and, with guidance from the foreign office, is responsible for the issuance of licenses for nuclear exports by the Federal Office for Industrial Economy (BGW). Customs authorities under the finance ministry enforce this license requirement.

Export sales of German nuclear power plants began with an order in 1968 from Argentina for the Atucha 340 EMW natural uranium heavy water reactor. ATTACHMENT A, gives data on nine other German nuclear power plant exports (eight PWR, one BWR) to seven countries (Netherlands, Austria, Switzerland, Iran, Brazil, Spain and Luxembourg). Some of these plants will not be commissioned until 1982. Available data suggest that seven of these nine orders total roughly DM 8 billion (roughly $3.2 billion original price estimates--not including first two reactors for Brazil). Comment: Credible economic data about German nuclear exports are difficult to obtain. This information is viewed as commercially sensitive.

There are few data on other significant German nuclear exports, with the exception of the transfer to Brazil of technology for a reactor components industry, a fuel element fabrication plant, a uranium enrichment demonstration plant and a chemical reprocessing pilot plant. The value of these exports--together with "up to eight nuclear power plants" prior to 1990, is usually given as DM 15-20 billion.

General data on FRG nuclear exports for 1974 (latest year available) indicate that exports totaled DM 173 million, of which DM 111 million for reactors, fuel elements and source and fissionable materials. (see attachment H)

Source and fissionable materials are exported from the FRG, primarily within the common market (i.e, through Euratom). In 1975, approximately 56 tonnes of irradiated fuel materials and 124 tonnes of non-irradiated nuclear fuel materials were exported. France received the largest share. With the permission of COCOM, the FRG exports natural

uranium to the Soviet Union for toll enrichment. COCOM required that the depleted uranium be returned to the FRG. Data on these exports to the USSR are not immediately available. However, the magnitude of these transactions is indicated by 1975 import statistics: The FRG received approximately 364 tonnes of depleted uranium and approximately 30 tonnes of 3 - 10 percent enriched uranium from the USSR (about 12 percent of its imports is of this latter material). See attachment A-1.

Industrial Capacity: The FRG possesses a pilot plant for reprocessing spent fuels: the "WAK" plant at Karlsruhe with a capacity of about 40 tonnes/year. (Attachment B) An integrated nuclear fuel cycle center, with a reprocessing capacity of 1500 tonnes/year, is scheduled for completion about 1985. Germany's uranium enrichment capacity is represented by the Urenco Tri-partite Dutch, British and German plant in the Netherlands. (Attachment C) This plant employes gas centrifuge technology and has a current capacity of about 60 tonnes SWU per year. Current plans provide for expansion to 200 tonnes SWU by mid-1978, and to 2000 tonnes SWU per year by 1986. Uranit, the German partner in this enterprise, recently announced plans to construct a Urenco plant in the FRG, with a capacity of 1000 tonnes SWU per year by 1985. The "jet nozzle" enrichment process is in a relatively early stage of development.

Estimates vary about the number of nuclear power plants that must be produced per year to maintain the economic viability of the German nuclear industry. One semi-official document implies that the production of four or five plants per year--including two export orders--would be adequate. Nuclear industry sources claim that eight nuclear power plant orders per year--including four orders--would be required to utilize current capacity. The leading German nuclear power producer, Kraftwerk Union (KWU), lost DM 47 million on a 1975 gross of DM 1.48 billion, primarily through the performance of necessary preliminary work on its backlog of contracts, many of which have not yet been licensed for construction. With DM 102 in investments, KWU holds DM 19.8 billion in contracts (DM30 billion, including letters of intent). A study indicated that each 1300 MWe nuclear power plant provides 39000 man years of employment. Public media report that some 300 German firms will be involved in the sale of German nuclear technology to Brazil.

APPENDIX I

Germany now has ten nuclear power plants operating (3,494 EMW) and some 27 additional units under construction, ordered or planned. These units, if contructed, would total approximately 34,000 EMW by about 1984. The "official" prediction for 1986 was recently lowered to 35-38,000 MWe, a target it may be difficult to achieve.

Statutory Requirements and Agreements for Cooperation

The FRG has many general agreements providing for international scientific and technological cooperation. Attachment E. Many of these would permit nuclear cooperation under specific agreements negotiated separately. Agreements explicitly providing for the export of significant nuclear technology or facilities outside of the common market exist only with Brazil and Iran.

In general, an agreement for cooperation would be required before the FRG would authorize the export of significant nuclear technology, materials, equipment or facilities.

We know of no explicit requirement for technical or economic justification as a precondition for the export of German nuclear technology. Our contacts explain that such criteria would be applied "pragmatically," not as a matter of law and probably only to the export of the more sensitive nuclear technologies. Exports of nuclear reactors desired by a recipient state would not be vetoed on these grounds. However, German financial institutions would consider this point carefully before approving any loans required. Government financial guarantees would not be given in such cases if the financing were not sound.

As noted above, the FRG has ratified the NPT and participates actively in the deliberations of the nuclear suppliers' group and COCOM. Consequently, the export of nuclear technology equipment or facilities covered by the NPT, the IAEA Trigger List, restrictions developed as a result of NSG consultations or COCOM restrictions, would be covered by specific agreements and export authorizations. Judging by the Brazilian example (Attachment F) the FRG would require:

-- a commitment to the non-proliferation principle,

-- a guarantee against use for any nuclear explosive device,

-- an obligation to employ suitable physical security measures, to be agreed,

APPENDIX I

-- IAEA safeguards, under "trilateral" agreement,

-- transfers and re-transfers of sensitive technology, materials, and facilities only with the permission of the FRG, and under IAEA safeguards,

-- "supplier involvement" in construction and operation of the sensitive facilities supplied,

-- a long-term obligation to accept safeguards on any facilities constructed using the technology supplied,

-- safeguards and physical security requirements not affected by termination of agreement.

The FRG would probably not seek provisions for bilateral safeguards rights or specific sanctions for non-compliance. In the German view, the IAEA and/or Euratom systems must assume these responsibilities. The German-Brazilian agreement also illustrates that the FRG was willing to transfer nuclear technology to a nation which has not signed the NPT--provided that the IAEA applies safeguards to the materials, equipment, facilities and technology transferred.

Regulatory and Licensing Functions

A. Under the FRG Atomic Law ("Atomgesetz") (Attachment 1), exports of source and fissionable materials require a license which is granted if the international obligations of the FRG are maintained and if the national security of the FRG is not endangered. Other nuclear materials, equipment, and facilities require an export license under the provisions of the Foreign Trade Act ("Aussenwirischaftsgesetz") if they are included in the "International Nuclear Energy List" Attachment G) reproduced therein (considered identical with the "Trigger List" of the IAEA "Zangger Committee"). The export licenses are issued by the Federal office for the Industrial Economy ("Bundesamt fuer gewerbliche wirtschaft") of the Ministry for Economic Affairs. The FRG foreign office advises. Customs authorities in the finance ministry enforce the license requirements. Nuclear components would also require an export license, if they are included on a Trigger List. We are not aware of any provisions for exceptions for government - government transfers.

Safeguards

A. To the best of our knowledge, the FRG has never conducted a bilateral safeguards inspection on any nuclear

export pending IAEA inspections. Exports within the EC are subject to the Euratom safeguards system and other significant exports have always triggered IAEA safeguards, including the Atucha nuclear power plant for Argentina, which was ordered in 1968.

The FRG-Brazil Agreement, often characterized by the FRG officials as a good example of an arrangement appropriate for a recipient nation that has not signed the NPT, provides that safeguards obligations are not affected by the termination of the agreement. However, neither this agreement nor the FRG-Brazil-IAEA trilateral safeguards agreement reserves to the FRG any residual safeguards rights. We are not aware that the FRG has ever asked to be provided with IAEA accountability data. As a party to the trilateral safeguards agreement with the IAEA and Brazil, however, the FRG does have certain rights and responsibilities with respect to reports on transfers under the cooperative program.

As noted above, safeguards obligations are not affected by termination of the FRG-Brazil agreement. The FRG is an effective supporter and participant in the IAEA safeguards program. The FRG has accepted research grants from the IAEA for the development of safeguards methodology, especially techniques capable of performing adequately with minimum intrusion.

Physical Security

The German-Brazilian agreement requires suitable physical security measures, to be agreed between the parties, who must also keep the IAEA informed as required by the safeguards trilateral agreement. We are not aware of specific physical security "reviews" conducted by officials of the FRG in any recipient country. For the German-Brazilian agreement, mutual agreement on suitable physical security measures is required. We are not aware, however, how this agreement would be achieved in practice. Presumably, the joint commission which is responsible for the cooperative program would provide an effective forum for this purpose.

We have no basis for an estimate of the action which the FRG, itself, would take should physical security measures prove weak or inadequate. This would, for example, be a violation of the German-Brazilian agreement which requires

"...measures necessary to guarantee the physical protection..." Our contacts explain that the supplier and recipient country would really agree on the "level" of physical security required. Specific "measures" consistent with the required level must be the responsibility of the recipient state.

Retransfers

Nuclear materials, equipment, facilities and technology transferred to Brazil by the FRG may be transferred to a third country only if the recipient country has concluded a safeguards agreement with the IAEA. Retransfers of "sensitive" materials, equipment, facilities and technological information can be made only with the consent of the FRG. There has not yet been a case in point to illustrate this concept in practice. In general, however, this would seem to be the responsibility of the FRG foreign office. We doubt that the same procedure used for authorizing exports from the FRG would be employed in this context. We assume that the FRG would depend upon the IAEA safeguards system to detect violations and unauthorized transfers.

Nuclear Export Financing

Basic policy in the FRG with regard to financing of exports is that commercial sources should provide the funding required. Based on the particular circumstances involved, official assistance may be provided in the form of a HERMES financial guarantee or insurance of commercial financing or through the Kreditanstalt fuer wiederaufbau (KFW) by means of a financial guarantee or direct credit. Concerning nuclear exports, the FRG has demonstrated a willingness to provide official assistance when requested due to the relatively large cost of these projects and due to the economic importance which the FRG attaches to nuclear exports -- provided of course, that statutory requirements are fully met. In point of fact, however, only three of the eight nuclear exports (Brazil, Argentina, and Spain) have received official financing assistance. Argentina received a direct credit from the KFW and the Spanish sale was supported by a KFW financial guarantee. Nuclear sales to the developed countries and to Iran have been handled on a purely commercial basis.

When a direct credit is involved, as in the Argentine case, financing could be a powerful lever for implementing non-proliferation and safeguards objectives since a subsidy

element is contained in the financing. Financial guarantees, however, actually increase the cost of the financial package. Therefore, its usefulness as a bargaining chip in these instances would be diminished. We are aware of no case where this tactic has yet been applied. Terms and interest rates are normally determined by conditions on private financial markets where the funds are obtained and therefore are also based on the credit-worthiness of the borrower. A direct credit from the KFW, according to most recent data, would carry an interest rate of 8 percent for a buyer loan and could carry a maturity of up to 12 years. No ceiling has been set on the extent of official liability for financing of nuclear exports.

When official financial assistance is involved, financial policies are in total accord with national policies. Assessment of economic and technical feasibility of nuclear sales is customarily performed by the selling firm in the FRG. Relevant studies are then submitted to HERMES, which in the case of nuclear exports would make the final decision of whether or not official financial assistance is warranted, as part of the material required before any official assistance will be granted. HERMES continually evaluates country risks as part of its decision-making process in providing official assistance. Political risk is of course a major part of this evaluation and assumes greater importance as HERMES' exposure in a particular country increases and in direct relation to the sensitivity of the export.

Nuclear Suppliers' Meetings

The FRG participated actively in the deliberations of the nuclear suppliers' group and announced its own commitment to observe the consensus reached. In the FRG view, this consensus confirmed the terms and conditions imposed on Brazil, an interpretation further strengthened by subsequent IAEA approval of the trilateral safeguards agreement. FRG officials have made this point in public statements.

Insofar as existing legislation permits, the NSG guidelines are now implemented by the FRG. We understand, however, that certain possible interpretations of the guidelines, i.e., those which would require safeguards on relatively conventional equipment especially prepared or designed for a nuclear purpose cannot yet be enforced, pending more detailed consultations about this criterion and amendment of domestic legislation. The FRG continues

APPENDIX I

to favor the IAEA as the implementing agency for the NSG guidelines (outside the common market). In the German view, the requirement for safeguards on technology negotiated by the FRG with Brazil and subsequently adopted by the NSG, filled a "loophole" in the NPT safeguards administered by the IAEA.

APPENDIX II

PEACEFUL NUCLEAR EXPORT POLICIES OF THE GOVERNMENT OF FRANCE

I. Background on Nuclear Activities

Overview of Program

The French Government Agency, Commissariat a L'Energie Atomique (CEA), has full responsibility for the promotion and coordination of every aspect of nuclear energy in France and performed by French interests in other countries. CEA was created by government decree on October 18, 1945, to advise the government and implement France's nuclear policy; pursue necessary research and development activities including basic and applied sciences related to nuclear matters; transfer nuclear technology to end-users including the national utility, Electricite de France, and private industry; perform studies and production of nuclear materials for the benefit of national defense; and study governmental measures for the protection of goods and people against any physical and environmental dangers of atomic energy.

National nuclear policy is developed principally in the Ministry of Industry and Research and through it by the CEA. Other ministries involved include the Ministry of Defense, which contributes policy direction to CEA's military nuclear research activities, the office of the Prime Minister, which directs the activities of the Secretary General of the Interministerial Committee on Safety and Protection, the Ministry of Health and the Ministry of the Quality of Life which also contribute to policies regarding safety and protection and the Ministry of Finance and the Ministry of Foreign Affairs which are involved in financing and international activities, respectively. Policies regarding French nuclear exports are subject to overview by a special interministerial council chaired by the president of the Republic, known as the Interministerial Council on Nuclear Export Policy.

II. Organization

1. Commissariat a L'Energie Atomique, CEA.

CEA is under the general direction of an administrator. Senior technical advice is provided by a high commissioner and general policy development is initiated by a senior central staff. Operational units of the CEA include:

SOURCE: Department of State

APPENDIX II

-- Military application

-- Nuclear materials through Cogema (Compagnie Generale Des Matieres Nucleaires) through participation in

-- Eurodif I, Eurodif II (aka Coredif), and enrichment

-- Mining and concentrate activities in France (Uranex, CFMU, Simo), in Niger (Somair, Cominak, in Gabon (COMUF), in Central Africa (URCA), in Canada (AMOK, SERU-NUCL), and in Australia, the USA, etc.

-- Reprocessing through United Reprocessors (UK, F, FRG) and subcontractors including St. Gobain, PUK.

-- Institute of Fundamental Research

-- Institute of Safety and Protection

-- Industrial nuclear application through:

-- Technicatome (Small reactors)

-- Novatome (LMFBR and HTGR) and subcontractors including Creusot Loire.

2. The Interministerial Committee on Safety and Protection

The Interministerial Committee on Safety and protection is supported by CEA's Institute of Safety and Protection and reports directly to the Prime Minister.

3. The Ministry of Foreign Affairs

The MFA has responsibility for all nuclear matters within an office of atomic affairs of the MFA under a director of scientific affairs.

III. Export Activity

French exports of nuclear reactors began in 1969 with the construction in Belgium of an 870 MWe reactor for SEMO. Two additional reactors were ordered for

APPENDIX II

Belgium in 1974, each with a capacity of 925 MWe. In 1976, Iran submitted a Letter of Intent to purchase two reactors of 925 MWe each and in the same year South Africa ordered two units of 922 MWe each.

Through the organization COGEMA, there are several French prospecting enterprises, mostly in association with foreign partners, which include operations in Niger, Gabon, Mauritania, Senegal, Canada, USA Australia, and Indonesia. While it is understood that there have been no exports of uranium mined to France, it is assumed that a significant portion of the uranium mined by French subsidiaries in other countries have been exported under French control to third countries.

In the enrichment field, France has an extensive construction program underway which enjoys partial foreign ownership in return for a proportionate share of the production of the facility. Eurodif I is a gaseous diffusion plant located at Tricastin which will have an estimated annual capacity of 10.7 million SWUs. Initial production is scheduled for 1979 with 2.3 million SWUs and full production is scheduled by 1982. A second such facility, Eurodif II, has been approved and is scheduled for five million SWUs with initial production beginning in 1984. Ownership of Eurodif I is divided as follows: France-43 percent; Italy-25 percent; Belgium-11 percent; Spain-11 percent; Iran-10 percent. Eurodif II has the following ownership: Eurodif I-51 percent; France-29 percent; Iran-20 percent. Ninety percent of the production of Eurodif I has been scheduled to to go shareholders and the remaining balance to Japanese, German and Swiss electrical utilities. No similar information is available on Eurodif II.

At Le Hague, France has a reprocessing facility which will reach 400 tonnes per year in 1978 and 800 tonnes per year by 1981. By 1981 the fuel storage pond at Le Hague will have a capacity of 1,250 tonnes. Current plans are to expand the reprocessing capacity at Le Hague to reach 1,500 tonnes per year by early 1990. Cogema manages Le Hague's operations and is under the auspices of the United Reprocessors which offers long-term contracts for storage of irradiated fuels scheduled for reprocessing.

APPENDIX II

IV. Industrial Capacity

The French industrial nuclear capacity for enrichment and reprocessing has been briefly outlined above. Pressurized water reactors are produced solely by Framatome. It is estimated that seven to eight reactors per year of the 900 MW to 1,200 MW electric size are necessary to maintain an economically viable industry.

In 1974, nine reactors including the Phenix LMFBR provide France with an installed nuclear capacity of 2,800 MWe. This capacity constituted 7.7 percent of the total national production of electricity (180 TWH). The long-term objective of the French electrical plan is to have 19,000 MWe installed by 1980 which would constitute 30 percent of the total power production (260/275 TWH), and by 1985 nuclear power is expected to provide 70 to 75 percent of the total production of electrical power. France's nuclear power plans scheduled three reactors of 900 MWe each to come into operation in 1976, one 900 MWe reactor in 1977, four similar reactors to begin services in 1978, and five reactors to begin services by 1979.

In 1982 and 1983, France's nuclear power plans call for a 1,300 MWe plant for each of the two years in addition to five 900 MWe plants scheduled for operation in 1982.

This planned program is ambitious and will fully accommodate the expectations in power demand growth in France. The planned program may also assist France in reducing the full-time operation of some fossil fuel plants and thus reduce necessary purchases of petroleum from other countries. In addition, the planned program leaves a strong desire for two to four nuclear reactors per year to be sold to other countries.

V. Statutory Requirements and Agreements for Cooperation

Laws and regulations governing atomic energy activities.

An ordinance of October 1945 provided for the creation of the CEA A government decree of 1963,

APPENDIX II

modified in 1973, grants authority for the building of nuclear reactors; a government circular of 1976 outlines procedures for public review of proposed sites for public utilities to select and build either fossil fuel or nuclear power plants; government decrees of 1974 regulates radioactive gaseous and liquid effluents and how their releases should be controlled; a decree of 1973 established a central service which is responsible for the safety of nuclear installations and which reports to the Ministry of Industry and Research. A decree of 1975 established the Interministerial Committee on Nuclear Security which reports to the Prime Minister.

VI. French Nuclear Agreements

Bilaterals:

Federal Republic of Germany, January 19, 1967, and July 6, 1971, high flux reactor;

Belgium, September 23, 1956, Ardennes nuclear plant;

Brazil, May 2, 1962, utilization of atomic energy, June 9, 1961, Euratom-Brazil Agreement;

Canada, September 30, 1968, plutonium;

Spain, July 27, 1967, December 15, 1967, November 26, 1970;

United States, May 7, 1959, Atomic Energy for Mutual Defense, July 27, 1961;

Indonesia, April 3, 1969;

Iran, June 27, 1974;

Iraq, November 18, 1975;

Japan, July 23, 1965, February 26, 1972, September 22, 1972, June 20, 1975;

Pakistan, December 14, 1962;

Switzerland July 19, 1956, September 13, 1965, European Organization for Nuclear Research, May 14, 1970;

Vietnam, January 28, 1961.

Multilaterals:

-- UNESCO Convention to Establish a European Organization for Nuclear Research (CERN), July 1, 1953, and amendments;

-- Convention following the statute of the International Agency for Atomic Energy, October 26, 1956, and amendments;

-- Treaty on the creation of C.E.E.A. (Atomic Energy European Community), March 25, 1957;

-- OECD decision on creation of the European Agency for Nuclear Energy, December 17, 1957;

-- Convention on the creation of Eurochemic, December 20, 1957;

-- OECD Convention on Civilian Responsibility in Nuclear Energy, 1960, and amendments;

-- OECD Convention on Maritime Transportation of Nuclear Materials, December 17, 1971;

-- IAEA-France-Japan accord on nuclear safeguards, September 22, 1972;

-- UK-FRG-France Exchange of Letters on Cooperation in the Field of Studies using Intense Neutrino Beams, December 19, 1972;

-- Second Protocol to Treaty on Non-Nuclear Arms In Latin America, July 18, 1973;

-- UK-FRG-France Convention on the Construction and Operation of a High Flux Reactor, July 19, 1974;

-- IAEA-South Korea-France Safeguards Agreement, September 22, 1975;

-- Accord on Cooperation Between C.E.E. A. and the International Atomic Energy Agency, December 1, 1975;

-- IAEA-Pakistan-France Safeguards Agreement, March 18, 1976.

APPENDIX II

VII. Criteria for Nuclear Exports

On September 1, 1976, the President of the Republic established the Council on Nuclear Export Policy with the President as Chairman. The members of the Council include the Prime Minister, the Ministers of Foreign Affairs, Defense, Economy and Finance, Industry and Research, Foreign Trade, and the Administrator of CEA. On October 11, 1976, the Council presented six general guidelines concerning the export of nuclear equipment, technologies and materials as follows:

On October 11, the Council presented six general guidelines concerning the export of nuclear equipment, technologies and materials:

(1) Nuclear energy represents for a certain number of countries a competitive source of energy necessary for development. Therefore, France will remain prepared to contribute to the implementation of the peaceful use of nuclear energy.

(2) France intends to keep full command of its nuclear export policies in accordance with relevant international agreements.

(3) France does not favor the proliferation of nuclear arms. In its nuclear export policy, France will reinforce appropriate safeguards and guarantees regarding nuclear equipment, materials and technologies.

(4) France will assure the security of supplies of nuclear fuels for nuclear plants that it has sold and will meet the legitimate needs of others for access to nuclear technologies. France will also ensure the services of all portions of the fuel cycle that are requested. France is ready to study with interested parties on a bilateral or multilateral basis agreements likely to guarantee these results.

(5) The French government is of the opinion that the supply of nuclear equipment, materials and technologies should not be such as to favor the proliferation of nuclear arms through commercial competition.

(6) France is prepared to discuss these problems with supplying countries and/or with receiving countries which are engaged in substantial programs of nuclear power plants.

On December 16, 1976, the Council presented a brief statement that, until further notice, the signature of bilateral contracts covering the sale to other countries of nuclear reprocessing plants would no longer be authorized. In practice, France requires a bilateral agreement covering safeguards and conditions for the sale of nuclear materials and sensitive technologies. In addition, it requires trilateral agreements with the IAEA covering that Agency's safeguards procedures. The details of these agreements appear fully compatible with the London suppliers' nuclear export policy guidelines. guidelines.

VIII. Regulatory and Licensing Functions

The Ministry of Finance through its director of customs and taxes has authority to regulate French exports. On a case-by-case basis, exporters are required to specifically identify equipment to be exported and its destination as part of the application for the export permit. The Ministry of Finance consults other interested agencies which, in the case of nuclear materials, would include the Ministry of Foreign Affairs and the CEA. The December 8, 1976, listing is fully compatible with suppliers' list, including identifying types and trigger quantities of nuclear materials, equipment and technology.

IX. Safeguards

The early French-built reactors in Belgium were subjected to Euratom safeguards. Later, contracts for French reactors in South Africa and those expected in Iran will require IAEA safeguards. France has supported the IAEA safeguards program and is expected to insist upon its provisions in the export of any nuclear material appropriately requiring such safeguards. Typically, French foreign sales arrangements consist of a bilateral agreement and a trilateral agreement with the IAEA.

APPENDIX II

The South African bilateral contains a provision which states that should the recipient partner withdraw from the NPT, IAEA safeguards or their equivalent will continue in force. There is no specific mention of sanctions that would be established if the recipient went so far as to obstruct or negate the application of any safeguards. The length of time for the safeguards coverage includes reference to the sensitive life of the nuclear materials and/or technologies. In the recently concluded trilateral agreement with IAEA and South Africa, France has made additional requirements that French-supplied fuel be exported from South Africa for reprocessing and that IAEA safeguards also apply to the subsequent construction of any reactors whose designs are based on the technology of the French-built reactors.

Although France has had a longstanding relationship with the IAEA, the one limitation is that France does not permit the extension of IAEA safeguards to all of the French nuclear facilities.

X. Physical Security

As a basic policy, France believes that physical security of nuclear materials is a matter which falls solely within the competence of a nation or state and is not a matter to be prescribed by international agreements or enforced through bilateral or multilateral accords. In the London suppliers' discussions, France has supported the guidelines on the classification of security and risk potentials of nuclear materials and equipment.

Within the bilateral agreement with South Africa (Article 3), provisions have been made for the recipient to undertake adequate physical security measures. However, there are no provisions for France to make prior inspections or to be continually advised of the state of South African physical security measures or to take any actions if these measures weaken or become inadequate.

XI. Retransfers

The Ministry of Finance through its division of customs is responsible for the export of specific materials from France. However, the Ministry of Foreign Affairs which has responsibility for the maintenance of international agreements would receive the request and would have responsibility for decisions regarding the re-export of nuclear materials, equipment or technology by a recipient country. France has followed the London suppliers' guidelines with regard to the extension of safeguards to retransfers of materials and technology. France does not require that any retransfer be done only with its prior approval.

XII. Nuclear Export Financing

There is little published regarding specific French policies and practices on the financing of nuclear exports. It is understood that the normal provisions of the Ministry of Finance regarding general exports cover nuclear exports as well. The terms and rates of loans are more severe than those of the US Ex-Im Bank. In the past, France has undertaken the sale of nuclear reactors as part of an overall government-to-government cooperative program. These arrangements have been part barter, part financing and involve a number of technical projects performed by France in the recipient country in exchange for certain volumes of commodities to be imported by France. It is not known precisely what the terms of a reactor sale have been in the context of these barter packages. The sale of two reactors to South Africa is assumed that there were no other commodity exchanges or purchase associated with the sale. However, the terms of the contract for the sale of two French reactors to South Africa are not known.

XIII. Nuclear Suppliers' Meetings

France has been an original and active participant in the London Nuclear Suppliers Group. After the unscheduled newspaper reporting on the results of the London Suppliers' meeting in late 1975 and early 1976, the French Foreign Minister presented the French National Assembly with France's own policies regarding the export of nuclear materials, equipment, and technology.

APPENDIX II

Since the advent of the London Suppliers' meetings, there has been a great change in the public posture of France regarding nuclear safeguards. This change in public posture is best evidenced by the creation of the Interministerial Council on Nuclear Export Policy and the statements issued by the Council to date.

Although France is not a signatory to the NPT, France has stated publicly that its actions will be as if France had signed the Treaty. France participated in the development of the London supplier's guidelines and has applied these principles to its export arrangements. Since September 1976, while excluding those arrangements involving previous commitments, France has taken a very different public posture on safeguards to the extent of postponing, indefinitely, future sales of sensitive technologies such as uranium enrichment and reprocessing facilities. To maintain a commercially viable business of its nuclear industry, France will sell nuclear reactors and supporting full fuel cycle services to responsible parties.

APPENDIX III

PEACEFUL NUCLEAR EXPORT POLICIES OF THE UNITED KINGDOM

1. Background on Nuclear Activities

A. Overview

In 1945 the UK established nuclear research centers at Harwell and Risley under the supervision of a Ministry of the Government. In 1950, a review of prospects for generating electricity from a nuclear reactor led to the construction of the world's first industrial scale reactor at Calder Hall in 1953. In the same year, the UK concluded that the growing importance of the industrial applications of atomic energy and the need for an organization more akin to that of a large industrial undertaking required that responsibility should be transferred to a nondepartmental organization. As a result, the United Kingdom Atomic Energy Authority was set up in 1954.

In 1955, the government announced a ten-year program for nuclear power. Under this plan, improved versions of Calder Hall (a Magnox reactor) were to be built by British industry for the various area generating boards so as to produce 1500 to 2000 megawatts (MW) of nuclear power by 1965. The program was subsequently escalated to call for the production of 5,000 MW by 1968. A second stage of the UK's nuclear power program was announced in 1964 to bring the total to 11,000 MW 1975. And in 1974, the government announced a further program of up to 4,000 MW.

The first stage of the nuclear power program has been completed. Eleven stations are in operation with a total capacity of 5,300 MW. Reactors exported to Italy (Latina) and Japan (Tokai Mura) produce 200 MW and 154 MW, respectively. For the second stage, twin reactor stations are still being constructed at five different locations based on the advanced gas cooled reactor (AGR) design developed by the UKAEA. Stations for the third stage are supposed to be ordered during the period 1974-1978. They will employ reactor units of up to 600-660 MW capacity based on the UKAEA-designed steam generating heavy water reactor (SGHWR).

SOURCE: Department of State

APPENDIX III

An experimental fast breeder reactor (DFR) was built and has been operating at Dounreay, Scotland, since 1959. As the world's first fast reactor to produce electricity for commercial use, it generates only about 14 MW of electricity but also is used as a test bed for the development of fast reactor fuels and materials. The hiring of radiation space in the reactor for experiments and associated preparatory and post irradiation work has earned more than 4 million pounds from overseas customers. The prototype fast reactor (PFR) should produce 250 MW of electricity when it reaches full power and pave the way for the large fast reactors that are planned from the late 1970's onward.

The various government departments and agencies involved with nuclear exports are (a) the Department of Energy, which maintains overall supervision of UK nuclear policy and reviews the annual budgets of government-funded activities involving entities such as the UKAEA, BNFL, and the nuclear power company, (b) the UKAEA, which is primarily responsible for conduct of R&D relating to the whole range of nuclear activities, including reactor design, (c) the National Nuclear Corporation, a partly government, partly privately owned corporation established for the purpose of building nuclear reactors for export as well as domestic use, (d) British Nuclear Fuels, Ltd. (described below, (e) the Foreign and Commonwealth Office, whose energy and arms control and disarmament divisions are responsible for developing and coordinating international nuclear energy policy including the negotiation of bilateral and multilateral agreements for cooperation and international safeguards and controls, and (f) the Department of Trade, which, as successor to the Board of Trade, is responsible for export controls imposed on various nuclear related equipment and materials.

B. Annual Statistics

Because of its virtually exclusive dedication to indigenous reactor concepts which have tended to have technical successes but commercial failures, Britian has had an extremely poor reactor export record. Except for small research research and training reactors, it has been unable to break into the commercial export market dominated by U.S., German and other firms which adhere to light water reactor designs. Export of reactor components amounted to only 2.2 million pounds sterling in 1975.

APPENDIX III

Much more successful have been British efforts in the field of nuclear fuel services carried out by British Nuclear Fuels, Ltd. (BNFL), which was established as a commercial offshoot of UKAEA six years ago. BNFL was organized to handle conversion and enrichment of uranium, the manufacture and supply of uranium and plutonium-based fuels and the provision of related fuel cycle services for nuclear power stations including the reprocessing of nuclear fuel. Exports for the financial year ending 31 March 1976 totaled 12.4 million pounds sterling compared to 5.9 million pounds sterling the previous years. Major customers are located in Germany, Japan, Italy, Spain, France and The Netherlands. Through various affiliates, BNFL participates in all aspects of the tripartite project with West Germany and the Netherlands for the purpose of developing and marketing enriched uranium produced by the centrifuge process. Smaller associated companies are involved in providing irradiated fuel reprocessing services in Germany and Italy.

The prospects for consideration expansion of nuclear fuel reprocessing facilities with a large component of overseas business depends to some extent on environmental constraints and international policies agreed to by major supplier countries.

C. Information on Industrial Nuclear Capacity

Reprocessing or irradiated magnox fuel from UK and overseas reactors is the main activity at the windscale works. The rate at which Magnox fuel can be reprocessed has in the past been restricted by limitations in the decanning plant. A major capital investment program for expansion of the present Magnox plant has been devised and will provide for new Magnox fuel receipt, pond storage, and decanning facilities. Plans for a major new oxise fuel storage and reprocessing facility for use in the 1980's is currently a subject of public debate. While design and development work are proceeding, final approval must be obtained from the Secretary of State for Environment. Contracts to reprocess fuel for overseas customers provide for the return to the customer of the resulting reaioactive waste which will involve turning higher activity fission product wastes now stored as liquid into solid blocks of glass. Negotiation of contract terms have been completed within the last year

APPENDIX III

with Japan and Spain. Development of the vitrification process for solidifying product wates is proceeding. Design and construction of a small scale pilot plant to handle actual waste has been undertaken and will be followed by further development facilities leading to the introduction of vitrification on a full production scale in the mid-1980's.

Progress in centrifuge enrichment technology has continued and the first prototype enrichment plant has now been operating satisfactorily for almost four years. The second prototype plant has been working for over two years while the first full scale production plant was scheduled for commissioning in 1976. Meanwhile, the diffusion plant at Capenhurst continues to produce enriched uranium for UK nuclear power stations with a minimum of problems. Additional capacity for manufacturing centrifuges has been built to provide for enrichment plant requirements during the period up to the early 1980's.

Following intense marketing activity in 1974 and 1975 when Urenco Ltd. (in which BNFL holds one-third share) secured orders for some 26,000 tons of separative work, there has been a slowing down in the ordering of nuclear power plants and hence, a turndown in the total enrichment market. Nevertheless, Urenco Ltd. has succeeded in obtaining letters of intent for further business worth some 200 million pounds, the work is to be divided between Capenhurst and Almelo in the Netherlands. The centrifuge machine development program is continuing with the objective of providing second generation machine. Development work is performed in close collaboration with BNFL's Dutch and German partners.

It is difficult to say what number of nuclear reactors must be produced annually to maintain the viability of the industry. Historically, as a consequence of poor forecasting, this has been a feast or famine business in the UK. The current 4,000 MW program based on the SGHWR is considered by most observers to be a nonstarter, with the referenced design more than a year and a half behind schedule and still not accepted. Recently, there has been renewed interest in switching

APPENDIX III

to LWR technology licensed from the U.S. or West Germany. The central policy review staff has suggested a scheme which would result in the nuclear power company becoming a turn-key engineering contractor with all the resources needed to compete in overseas, mainly Middle East, markets for nuclear power plants. Given the state of paralysis in the UK nuclear reactor program for the past three years due to a combination of political and economic circumstances, it would be premature to predict success of this latest proposal. Nonetheless, unless the industry can look forward to at least two nuclear power plant orders, either foreign or domestic, each 18 months to two years, it would appear difficult to avoid the virtual disappearance of an across-the-board UK capacity. In this event, boilers and turbo generators would appear to be the most propitious items for British manufacture.

2. Statutory Requirements and Agreements for Cooperation

A. Laws and Regulations

Atomic Energy Authority Act, 1954.

Radioactive Substances Act, 1960.

Nuclear Installations Act, 1965.

Nuclear Installations (Amendment) Act, 1965.

Statutory Instruments 1970 No. 1288 - Customs and Excise - The Export of Goods (Control) Order 1970.

Atomic Energy Authority Act 1971, Chapter 11.

B. List of Nuclear Agreements Between the UK and Recipients.

The UK generally conducts its international cooperation in the peaceful uses of nuclear energy without entering into formal agreements. One exception is the Agreement with Romania which was necessary to satisfy their domestic requirements.

3. Requirements for Technical or Economic Justifications or Criteria as a Condition for Nuclear Exports.

UK policy on the export of nuclear equipment materials or technology was laid down by the Secretary of State

APPENDIX III

for Foreign Affairs Callaghan in reply to a written parliamentary question on March 31, 1976. In brief, it sets out that a proposed export is considered on its own merits with due consideration being accorded the NPT, the Euratom Treaty, and whether or not the prospective customer has concluded a safeguards agreement with the IAEA.

4. Regulatory and Licensing Functions.

Under the export of Goods (Control) Order 1970, export control is imposed on the export of particle accelerators, uranium hexofluoride production plant and machines for processing nuclear materials to countries other than commonwealth countries (except Southern Rhodesia) the Irish Republic, the Republic of South Africa and the USA. The list of nuclear-related materials and equipment for which an export license is required, laid down in the 1970 Order, may soon be amended.

5. Safeguards.

The 1972 Act providing for accession to the European Communities had the effect of incorporating the Community treaties and their dependent regulations, etc., within the body of UK law. Under the Act, Euratom applies safeguards to nuclear material within the UK assigned to peaceful purposes to the extent necessary to verify that (a) material is not being diverted from its intended uses as declared by the UK; and (b) material in respect of which a safeguarding obligation has been assumed by Euratom or the UK is used in accordance with that obligation.

As a party to the NPT, the UK is under an obligation not to supply nuclear weapons or to give assistance in producing weapons to nonnuclear weapons states. Moreover, the UK cannot supply nuclear material for peaceful purposes unless the materials are subject to safeguards under an Agreement with the IAEA.

In 1967 the UK undertook present obligations which require that when international safeguards were introduced in nonnuclear weapons states to implement the relevant NPT provisions, they would accept similar safeguards in the UK subject to exclusions for reasons of national security. In addition, some bilateral agreements with the UK allow the second state the right to apply safeguards to its nuclear material after transfer to the UK. Such safeguards are from time to time invoked, notably

by Canada. Re-export without the permission of the supplying state is usually prohibited.

Apart from the relevant provisions of the Euratom Treaty and regulations, the only item of UK legislation related to the above-mentioned international requirements is S.I. 1970 No. 1288 imposing export control on certain nuclear materials and equipment.

6. Physical Security.

Appropriate security precautions against sabotage or terrorist attack both at nuclear installations and fissile material in transit are taken in connection with all nuclear activities and are kept under regular review. Armed guards are used on certain sites and to accompany fissile material in transit.

7. Nuclear Export Financing.

As noted above, there is no policy laid down by the UK on export financing. The pros and cons of each case are examined on its own merits.

APPENDIX IV

PEACEFUI NUCLEAR EXPORT POLICIES OF THE GOVERNMENT OF CANADA

Background on Nuclear Activities

1. Overview.

Canada was one of the first countries to engage in atomic energy research and development. In September 1945, a small reactor called the ZEEP, located at Chalk River, was the first reactor to produce power outside of the United States. Other test, experimental and power demonstration plants started operation in 1962. The first commercial Candu power plant (Douglas Point) came into operation in 1967. Canada now has 38 Candu reactors in operation, under construction, committed or planned and has focussed on heavy water cooled and moderated, natural uranium fueled reactors using pressurized tubes. Canada also is a major supplier of natural uranium and of radio-isotopes for medical and industrial applications.

In support of Candu reactors and export sales, Canada produces its heavy water supply at Bruce, Port Hawksburg, and Glace Bay production plants. Canada has two major nuclear R&D centers located at Chalk River, Ontario, and Pinawa, Manitoba in which the main areas of R&D are nuclear physics, solid state physics, chemistry, material science, biology, and waste management.

2. Organization

The Canadian Government has four major organizational divisions which are responsible for Canada's peaceful nuclear energy program: (1) Atomic Energy of Canada Limited, (2) The Atomic Energy Control Board, (3) The Department of Industry, Trade, and Commerce, and (4) The Department of External Affairs.

Atomic Energy of Canada Limited (AECL)

Atomic Energy of Canada Limited is a Crown Company incorporated in February 1952 under the Companies Act (Canada Corporation Act) pursuant to the Atomic Energy Control Act, AECL reports to the Ministry of Energy,

SOURCE: Department of State

APPENDIX IV

Mines and Resources and is responsible for the promotional aspects of the Canadian program and for research into and development of the peaceful uses of atomic energy, in particular the development of nuclear power systems to meet Canadian needs and develop improved applications of radioisotopes and radiation.

Atomic Energy Control Board (AECB)

In Canada, atomic energy facilities, equipment and materials are controlled by the Atomic Energy Control Board under the authority of the Federal Atomic Energy Control Act, which came into force in 1946. The primary role of the Board, as summarized in the preamble to the Act is "to make provisions for the control and supervision of the development, application and use of atomic energy, and to enable Canada to participate effectively in measures of international control of atomic energy which may hereafter be agreed upon." The Act was amended in 1954 giving the Board responsibility for only the regulatory and other non-promotional aspects of the program as follows: "control of nuclear facilities in the interest of health and safety, control of atomic energy materials, equipment and information in the interest of national and international security; and control of awards of grants in aid for atomic energy research." The Act is currently being rewritten to emphasize protection of the environment. The Board, consisting of five members who are responsible for licensing and regulating atomic materials and equipment similar to NRC's functions in the United States, reports to the Parliament through the Minister of Energy, Mines, and Resources.

The Department of Industry, Trade, and Commerce

The Department of Industry, Trade, and Commerce reports to the Minister of Industry, Trade, and Commerce and has the responsibility for issuing export permits for items listed of the Government of Canada "Export/Import Control List." Permits for the export of nuclear items contained on the List are issued only on the advice of the Atomic Energy Control Board which concurs

in the issuance of permits only if safeguards to be applied by the recipient are acceptable. In a case involving the potential export of a Candu power plant to a new recipient country, for example, the Department of External Affairs is responsible for negotiating an agreement for cooperation containing appropriate controls and safeguards. AECL provides the reactor design and engineering assistance to private industry which fabricates the hardware. The Department of Industry, Trade, and Commerce, with the Atomic Energy Control Board's concurrence, issues the export permit for controlled items.

3. Annual Statistics on Canada's Nuclear Export Activities

Canada exports uranium, Candu and research reactors, radioisotopes, radiation equipment, and heavy water for the reactors it supplies. The radioisotopes and radiation equipment are sold worldwide, and the level of sales is about $10 million/year. Currently uranium sales are about 5,000 to 7,000 tons U_3O_8/year. Candu reactors have been sold to Pakistan, India, Argentina, and South Korea. Research reactors have been sold to Taiwan and India. Figures are not readily available on Candu sales but the current backlog is estimated to provide an annual level of sales valued at approximately $200 million for the period extending from 1976 - 1981.

4. Industrial Nuclear Capacity

Canada is not in the nuclear fuel enrichment or reprocessing business and is therefore not a supplier of these services. In the absence of export capabilities to supply services for these two components of the nuclear fuel cycle Canada's nuclear industry depends entirely on the export of Candu reactors, heavy water, and uranium as major commodities to maintain competitiveness in the international nuclear trade market. The number of nuclear power reactors, of the 600 MWe size, required to provide a viable nuclear industry is estimated at 2 - 4 reactors per year including both domestic and foreign orders.

Although financial constraints affecting domestic utilities have extended planned construction schedules, current and projected domestic demands for reactors

APPENDIX IV

predicted at the end of 1976 indicates that Canada should have an installed net nuclear capacity of 3.3 GWE in 1980, 11.3 GWE in 1985; 24.5 GWE in 1990, and 47.1 GWE in 1995.

5. Statutory Requirements and Agreements for Cooperation

1. Canadian laws and regulations governing atomic energy activities.

Legislation

-- Atomic Energy Control Act, R.S. 1970, C.A.-19.

-- Nuclear Liability Act, R.S. 1970, ch. 29.

-- First Supply legislation - not yet proclaimed.

Regulations

-- Atomic Energy Control regulations, SOR DORS/ 74-334, 4 June 1974, including atomic energy control orders affecting the Atomic Energy Control Board contained in the Canada Gazette, Part I, dated June 8, 1974, pages 2260-2270.

2. List of nuclear agreements between the Government of Canada and Recipients

The Government of Canada has agreements for cooperation in the peaceful uses of atomic energy with: Argentina, Australia, Euratom, Finland, Germany, (FRG), IAEA, India, Iran, Japan, Korea, Pakistan, Spain, Sweden, Switzerland, and the United States.

3. Requirements for technical or economic justification

In determining and establishing requirements for technical or economic justification or criteria as conditions for nuclear exports, the Government of Canada examines alternate energy sources available to the recipient country, the country's total energy demand, availability of capital for financing the export, and the technical and industrial infrastructure of the recipient before considering the export of nuclear equipment and materials.

Peaceful Uses Agreements. Canada does not provide any nuclear materials, equipment, technology, or assistance in the absence of a peaceful uses agreement. Under any new contract, the recipient of nuclear materials, equipment, or technology must be an NPT signatory or accept international safeguards on their entire nuclear program. In bilateral negotiations, agreements include binding assurances that the recipient partner will not divert peaceful nuclear materials to produce nuclear explosive devices and agree to stipulated sanctions for non-compliance with respect to reprocessing, transfers, and re-transfers prohibitive clauses.

6. Regulatory and Licensing Functions

The Export Control List (SORS/DORS/73-253) provides procedures for authorizing exports of nuclear components, materials and nuclear related items. The criteria for authorizing, licensing and regulating nuclear exports is the joint responsibility of the Atomic Energy Control Board and the Department of Industry, Trade, and Commerce. All applications for the export of nuclear materials, equipment, and technology require approval of the Atomic Energy Control Board before an export permit can be issued by the Department of Industry, Trade, and Commerce. Group 8 items of the Export Control List governs atomic energy materials, including special nuclear materials, equipment, types and trigger list quantities of nuclear materials. Group 10 items govern technology exports including sensitive technologies.

7. Safeguards

Bilateral safeguards inspections prior to the export of Canadian-origin materials have been limited to countries such as France, FRG, Switzerland, Italy, and the United Kingdom. Residual safeguards rights are provided in bilateral agreements in the event that IAEA or Euratom safeguards can no longer be effectively applied. As a part of bilateral agreements negotiated since 1974, the Government of Canada has obtained the right of access to IAEA accountability inspection information from their bilateral partners. Consultation provisions in the agreements also provide an additional mechanism for obtaining safeguards accountability information.

Since 1974, the Government of Canada has negotiated provisions in the agreements in which safeguards will cover the entire life of Canadian-supplied facilities, equipment, nuclear materials, and all subsequent fissile materials produced. In addition, the recent Canadian nuclear policy statement (December 22, 1976), makes full-scope safeguards a mandatory condition of supply.

8. Physical Security

Recipients of Canadian-supplied reactors, equipment, and nuclear materials are required to provide adequate physical safeguards measures and procedures. Canadian standards for physical safeguards (physical protection) are compatible with the nuclear suppliers guidelines, which in turn are consistent with those recommended in IAEA's publication INFCIRC/225.

For new recipient countries, Canada conducts physical safeguards reviews to determine that plans for physical safeguards measures are adequate prior to exportation significant quantities of special nuclear materials. To ascertain that the recipient country maintains adequate physical safeguards measures, periodic consultations and safeguards review rights are provided in agreements negotiated between Canada and the recipient partner. If, during consultation and review activities, Canada determines that physical safeguards measures are less than adequate Canada may exercise the right to withhold further supply of materials until adequate physical safeguards measures are instituted.

9. Retransfers

All bilateral agreements since 1974, and some prior to these new procedures, prohibit the re-transfers of Canadian-supplied nuclear materials and equipment. According to regulations and procedures, the Atomic Energy Control Board must approve original exports prior to the issuance of an export permit. Likewise, re-transfers must also be approved by the Atomic Energy Control Board in consultation with the Department of External Affairs.

APPENDIX IV

Verification clauses contained in bilateral agreements provide a process to detect unauthorized transfers by establishing controls over retransfers, reprocessing and enrichment involving Canadian-supplied materials, equipment or technology.

10. Nuclear Export Financing

Each new application for a reactor sale must be approved by the full cabinet. In making a determination with respect to the proposed reactor sale the Cabinet considers the technical assessment of the country, political assessment, alternate power sources available and installed, economics, energy requirements and safeguards. Although safeguards are not directly tied to financing Canadian law requires adequate physical safeguards prior to the export of reactors, nuclear materials, and equipment.

The first choices, for financing to stimulate nuclear exports including applicable terms and interest rates, are from private sources or through the recipient's government financing procedures. Otherwise, nuclear exports are financed through the Canadian Export Development Corporation (EDC) which has close coordination with the U.S. Export/Import Bank on terms and conditions for financing. Canada has no separate financing policies or requirements specifically applied to the export of sensitive technologies. As stated above, economic feasibility, political stability, energy requirements, and alternate energy source are evaluated by the full Cabinet in considering the export of reactors, nuclear materials, and

11. Nuclear Suppliers' Meeting

The Canadians believe that December 22, 1976, policy statement leads, rather than follows the nuclear suppliers' guidelines and policies, in that it requires comprehensive, full-scope safeguards as a condition of supply. The Canadians hope that the IAEA and the Suppliers' Group will follow the Canadians' lead in further strengthening safeguards.

PEACEFUL NUCLEAR EXPORT POLICIES OF THE GOVERNMENT OF JAPAN

I. Background on Nuclear Activities

Overview

Policy governing the development of nuclear energy for peaceful purposes has been the responsibility of the Japan Atomic Energy Commission since its formation on January 1, 1956. The Commission consists of six commissioners serving three-year terms and a chairman. Up to three commissioners may serve part time. The chairman was previously the Director-General of the Science and Technology Agency (STA), a political appointment usually of relatively short duration. The JAEC has recently been elevated in stature so that it now reports to the Prime Minister. At any rate, the JAEC deputy chairman is the key policy-making individual.

The JAEC was established to plan, deliberate and decide on matters concerning atomic energy utilization, policy administration, long-range planning, regulatory activities, safety, training, reporting and other activities as assigned.

Organization

Research and development activities of the GOJ in atomic energy are carried out by five semi-government organizations. Although the government is the main source of funding of these R&D organizations, they also accept funds from private sources. They are linked to or are under the supervision of the Prime Minister's office or the STA which is headed by a cabinet minister who reports to the PM. STA has reporting to it the Atomic Energy Bureau (AEB) and the Nuclear Safety Bureau (NSB), roughly comparable in responsibility to ERDA and NRC. Lines of authority are much more loosely drawn in the R&D conducting organizations than in comparable situations in the U.S.

The five R&D organizations are:

A. Japan Atomic Energy Research Institute (JAERI) which conducts the research side of nuclear R&D including fusion and which is roughly comparable to an ERDA multi-disciplinary laboratory.

SOURCE: Department of State

APPENDIX V

B. Power Reactor and Nuclear Fuel Development Corporation (PNC) which is more engineering oriented and was formed for: 1. advanced reactor development, primarily LMFBR, but also including ATR, a heavy water moderated natural uranium fueled reactor, 2. development and installation of uranium enrichment facilities, 3. installation and operation of spent nuclear fuel reprocessing capability, 4. uranium ore prospecting, mining and refining, 5. nuclear waste management. It corresponds roughly to an ERDA engineering laboratory.

C. Japan Nuclear Ship Development Agency (JNSDA) which was established in 1963 for the construction of Japan's nuclear ship, the Mutsu.

D. National Institute of Radiological Sciences which is responsible for conducting research on preventative and remedial public health as it relates to radiation effects.

E. Institute of Physics and Chemistry Research which is responsible for scientific research.

The Ministry of International Trade and Industry, MITI, is responsible for the promotion of domestic industry, for the promotion of international trade and for the licensing of exported material and equipment. As it relates to this subject, MITI's two primary branches are the Agency for Natural Resources and Energy (ANRE) and the Agency for Industrial Science and Technology (AIST). AIST manages government-sponsored non-nuclear energy R&D. ANRE is responsible for the promotion of commercial nuclear power plants and has been given specific directions to push Japanese nuclear industry as a top priority matter so that nuclear growth is accelerated in Japan. A decision to license for export (or import) nuclear materials requires MITI's approval, in the process of which it consults with the STA. The AEB and the NSB are operationally involved in this review process. STA's review is made from the points of view of: (1) overall nuclear energy development, (2) nuclear safety development, (3) safeguards aspects and, (4) nuclear weapons non-proliferation.

Development of international nuclear policy, particularly with regard to the political aspects of non-proliferation, is the responsibility of Ministry of Foreign Affairs. The United Nations Bureau of the Ministry

APPENDIX V

has scientific affairs and disarmament divisions, both of which are involved in policy matters. Representation at London Suppliers Meetings and at IAEA General Conferences has come in part from UN Bureau and its division.

II. Statistics on Export Activity

Radioisotopes for medical treatment or diagnostic purposes, and industrial nuclear equipment such as thickness gauges have been exported. However, up to now there has been no nuclear export activity of consequence which has either nuclear power or nuclear weapons implications. The first potential export of major nuclear power significance may be the manufacture in Japan of nuclear power reactor components for PWR's for the USSR. The MOFA and MITI will be heavily involved in this matter, should it mature to the point of requiring an export license. It is specifically MOFA's responsibility to conduct the necessary analysis for conformance with COCOM requirements to restrict transfer of sensitive technology to communist countries.

III. Industrial Nuclear Capability

Japan is currently working on the development of a centrifuge enrichment process. PNC is responsible for the development and installation of a uranium enrichment plant targeted at supplying at least a portion of Japan's future enrichment requirements. The first cascade, consisting of 180 centrifuges, went into operation in the fall of 1974; the second cascade, consisting of 247 centrifuges, went into operation in the summer of 1976. The three centrifuge suppliers, Mitsubishi, Hitachi and Toshiba, are preparing to cooperate on an enrichment pilot plant comprised of some 7,000 to 10,000 centrifuges, providing the authority is granted allowing them to cooperate in this effort. The pilot plant is scheduled for completion in the early 1980's. Subsequently, a production facility is expected to supply a significant portion of Japan's enriched uranium requirements in the 1990's.

PNC's Tokai-Mura LWR spent fuel reprocessing plant, built by Saint Gobain Nucleaire and PNC, is currently in cold test operation. This 210 MT/year facility is scheduled to go into hot test operation early in 1977 and into commercial operation in 1978.

At the present time there are 13 nuclear power plants in operation in Japan for a total of 7400 MWe. The first of these is a Calder Hall type CO2 cooled, 166 MWe nuclear plant which went into operation in July 1966. Six of the remainder are BWR's and five are PWR's. The plants are 350 to 826 MWe in size and went into commercial operation in the following sequence: two in 1970, one in operation in 1971, one in 1972, three in 1974, two in 1975, and three in 1976.

There are 15 plants under construction. They are expected to go into operation as follows: two in 1977, five in 1978, one in 1979, two in 1980, one in 1981, one in 1982 and three in 1983. These vary in size from 524 MWe to 1100 MWe.

The early plants were turnkey plants delivered by General Electric and Westinghouse using mostly U.S. equipment. Recent plants are being built by Mitsubishi, Hitachi and Toshiba, mostly with Japanese equipment. The nuclear industry in Japan currently has the capability to fabricate two or three big plants (1100 MWe) per year.

Statutory Requirements and Agreements for Cooperation

I. Laws and Regulations

Japan's "Atomic Energy Basic Law" provides for research, development and utilization of atomic energy for peaceful purposes. It defines the constituency and functions of the Atomic Energy Commission and the two quasi-governmental organizations which conduct the vast percentage of its R&D, JAERI and PNC. The law describes the development and acquisition of minerals relating to Atomic Energy and controls to be exercised over nuclear fuel materials and reactors. It also defines patent relationships, protection from radiation hazards and compensation. There is, in addition, a law concerning the prevention of hazards from radiation which provides for the use, handling and obligations of users and sellers of radioisotopes.

II. Agreements

Japan has nuclear agreements with the U.S. Australia, France, Canada and the UK. Each of these bilaterals is accompanied by a corresponding trilateral with IAEA. The Canadian agreement is currently under renegotiation. Japan has an agreement of cooperation in the field of

science and technology, which includes nuclear, with the FRG, but the agreement is restricted to information exchange and excludes the supplying of nuclear materials.

The bilaterals are written as mutually applicable to each signatory country; though there is a definite supplier/customer relationship with Japan on the receiving end, reciprocity provisions are included.

III. Justification

At the present time, the condition which constrains nuclear exports from Japan is a brief policy statement made by the JAEC in 1962. The policy requires that exported materials and equipment will be used by the recipient country solely for peaceful purposes. It is expected that in the near future the JAEC will develop more extensive and restrictive requirements, particularly relating to the non-proliferation of nuclear weapons.

Regulatory and Licensing Functions

I. Criteria

At the present time there are no standard regulatory and licensing criteria for nuclear exports.

II. Trigger List

Trigger list guidelines are being developed which would place under control quantities and types of materials along the lines of the Zangger List and as discussed in the London talks.

III. Conditions

There are no special conditions at the present which must be met on exports of SNM, heavy water plants, enrichment, and reprocessing facilities except for NPT Article III.2. Japan does not expect or plan at this time to export any of these materials or equipment.

IV. Authorizing Procedures

There are no special procedures for authorizing the export of nuclear components. The same procedures apply as to the export of a facility.

V. Exception

There are no exceptions to the general export control procedures, but the procedures are in the very early stage of formulation and have not been applied to an actual case.

Safeguards

As indicated above, Japan has not entered into an agreement as a nuclear supplier as yet and is at the present time in the process of formulating its export policy and procedures. No provisions have been made to extend safeguards rights beyond the agreement expiration date. However, Japan is taking the position that as long as nuclear material remains in a receiving country, the covering safeguards agreement cannot expire.

Japan has been supporting IAEA's safeguards program by:

A. Technical assistance -- research contracts and research agreements.

B. Participation in IAEA's Perfex program.

C. Participation in IAEA advisory groups, consultant groups, panels, etc.

D. Participation of Japanese technical experts in IAEA Secretariat.

Japan has expressed a general desire to strengthen IAEA safeguards. Beyond this, specific suggestions have been made at suppliers' conferences.

Physical Security

Japan indicates that it is following the London suppliers' guidelines. Since essentially no material has been exported, the need for physical security reviews has not arisen.

Retransfers

Japan has strong desires and ideas as to how retransfers should be implemented and policed, but currently has no procedures or system for approving retransfers, nor process to detect unauthorized transfers.

APPENDIX V

Nuclear Export Financing

It is expected that the Eximbank of Japan would finance up to 80 percent of a large nuclear equipment export. Japan Eximbank JFY 1977 loan quota is yen 708 billion. A financing action associated with a nuclear export would be closely coordinated with MOFA, MITI, STA, the PM, and the Cabinet, and conducted under the nuclear export policies of the GOJ. It could be in the form of a loan to the buyer or an export credit to the exporter.

Nuclear Suppliers Meetings

I. Public Statements

Japan has refrained from making public statements regarding future actions it will follow as a result of the Suppliers' meetings, but since ratification of the NPT Japan has expressed support of goals of suppliers conferences.

II. Changes

Japan's export policy program and procedures are in the early formative stages.

III. Impact on IAEA

It seems reasonable to anticipate a significant increase in IAEA responsibilities as a consequence of what we expect to be Japan's future codified export policy.

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