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JOINT PROGRESS REPORT (STATE DEPARTMENT AND AEC) ON IMPLEMENTATION OF NSC 5507/2 - "PEACEFUL USES OF ATOMIC ENERGY"

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PEACEFUL USES OF ATOMIC ENERGY

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PART I - INTRODUCTION

The first joint progress report on the implementation of NSC 5507/2 was submitted by the Atomic Energy Commission and the Department of State on August 13, 1956. The present report covers the period from that date to February 28, 1957. Part II contains an evaluation of the success which has been obtained in achieving the objectives set forth in paragraph 22 of NSC 5507/2; Part III is a detailed summary of activities undertaken to carry out the courses of action directed in paragraphs 24-33; and Part IV sets forth certain recommendations for revision of the policy statement. Part V contains the separate views of Commissioner Thomas E. Murray, USAEC.

PART II - EVALUATION OF SUCCESS IN ACHIEVING OBJECTIVES

Under NSC 5507/2, the program objectives are: to maintain United States leadership in the development of the peaceful uses of atomic energy, particularly atomic power; to promote such development in free nations abroad as rapidly as possible; to promote cohesion within the free world; to forestall successful Soviet exploitation of the peaceful uses of atomic energy; to assure continued United States access to source materials; and to prevent diversion of fissionable materials to non-peaceful uses.

A. MAINTAINING U.S. LEADERSHIP

It is generally acknowledged throughout the free world that the United States continues to maintain leadership in the peaceful uses of atomic energy and in the international "Atoms for Peace" field. No country or combination of countries in the world is undertaking research and development in the field of power reactors on such a wide front and broad scale as the U.S. The interest of cooperating countries in technical as well as material assistance constitutes a recognition of the technical lead of the United States, despite the special circumstances which justify early construction programs in other countries. The large programs for the production of nuclear power which have been announced by the United Kingdom and the Soviet Union have been used to give support to charges that the United States is lagging in power reactor technology. These charges, however, are based almost entirely upon comparisons of the number of kilowatts of electricity produced, do not give recognition to the economic differences which exist in countries lacking adequate conventional fuel sources, fail to take account of the "dual purpose" of reactors in the U.K. and U.S.S.R., and overlook the continuing

technological advances being made toward economic nuclear power both domestically and abroad as a result of programs being conducted by the U.S.

The United States lead in international cooperation has been maintained on two broad fronts: (1) bilaterally through agreements for cooperation negotiated under the Atomic Energy Act of 1954, and (2) multilaterally by the assumption of leadership and responsibility in the establishment of the proposed International Atomic Energy Agency, by proposals for cooperative approaches through the Asian Regional Nuclear Research Center and the Organization of American States, and by encouragement given to EURATOM and OEEC planning for atomic energy programs.

Although other countries in a position to do so have undertaken bilateral programs, none have approached the extensive and continuously growing program of the United States in Asia, Latin America, and Europe. U.S. leadership in the establishment of the IAEA has been evident from the inception, was clearly apparent during the International Conference on the Peaceful Uses of Atomic Energy, and was confirmed by the President's announcement that the United States would make available to the Agency 5,000 kilograms of enriched uranium.

B. USING U.S. LEADERSHIP TO PROMOTE FREE WORLD COHESION

Through the encouragement of regional activities in Europe and in Asia and participation in the development of nuclear plans for the Organization of American States in Latin America, the United States has made a significant contribution in the promotion of cohesion in those areas of the free world. Moreover, the extent of the assistance offered under our bilateral programs demonstrate to Free World countries that their best interests in the field of atomic energy are served by close association with the United States. Soviet offers of assistance, limited in scope to offers of isotopes and training for countries outside the Soviet Bloc

and Red China (except for Yugoslavia and Egypt), have not presented a significant challenge to the U.S.

In certain important countries, such as India (and to a lesser degree, Japan), there is a reluctance to become too closely tied to or dependent upon the United States. These countries, as well as some others, appear to be planning programs leading to development of their own domestic or uncontrolled sources of nuclear materials and hence relative freedom from U. S. influence. Some European countries (France and Germany, for example) show similar interests, however they are also showing a strong interest in enriched uranium reactors.

C. ATOMIC ENERGY PROGRESS IN FREE NATIONS ABROAD.

Underlying the objectives of the Atoms for Peace program are two basic purposes: — (a) to assist other nations in achieving the material values of atomic energy: electric power, treatment and prevention of disease, and extraordinary service to agriculture, industry, and science itself; and (b) the political and psychological advantages to be derived from (1) a demonstration of the willingness of the United States to devote its leadership in the peaceful uses of atomic energy to the benefit of the free world, and (2) the establishment of an international atmosphere of cooperation conducive to progress toward effective agreement with the Soviet Union on the control of nuclear energy.

In assessing the material progress which has been accomplished so far, the following considerations are relevant:

a. the program has been in effect about three years;

b. the first phase of the program has been political rather than technical and has consisted of the establishment of U. S. relationships in the field of atomic energy with other nations or groups of nations and U. S. leadership in the formation of the International Atomic Energy Agency;

c. knowledge of atomic energy and its immediate potential, as well as the existence of competent scientific communities, varies greatly among the nations of the world;

d. there was a general tendency, particularly among developing countries, at first to regard atomic energy as an immediate opportunity to achieve a more abundant and healthy life for their people;

e. there are considerations other than those related to scientific and technical development which affect material progress abroad; among these are local financial conditions and dollar exchange positions, internal politics and struggles for leadership, and administrative and legal problems, such as the question of third party liability. There are also administrative and legal problems within the U. S. which affect the international program.

For the most part, U. S. Government representatives engaged in the program have been sensitive to the danger of over-selling the potential for immediate tangible benefits from the peaceful uses of atomic energy. As a result of the International Atomic Energy Geneva Conference, technical and economic conferences and discussions with representatives of cooperating countries, Atoms for Peace missions abroad, and the general educative process which has taken place, a greater understanding now exists concerning the inherent complexities of atomic energy programs, the extensive time schedules involved, the economies of nuclear power, and the necessity for first establishing sound political and administrative and scientific and technical bases. The promise is as great as in 1954; the obstacles to its fulfillment are more clearly seen. Accordingly, the effort in underdeveloped countries now centers around training in basic as well as nuclear sciences, assistance in the establishment of research facilities, in the development of programs for the application of radioisotopes in medicine and agriculture, and encouragement

in the development of cooperative regional efforts such as the Asian Nuclear Center and the proposed activities of the Organization of American States. Considerable progress along these lines has been accomplished, but any future revision of NSC 5507/2 should take into account the problems faced by developing nations in establishing national programs and the time necessarily required before those countries will be able to realize to any great extent many of the material values of atomic energy -- particularly the production of electric power.

The situation is quite different in the industrial countries of the world, such as those of Western Europe and Japan, and in the Scandinavian countries. Although no exclusively power producing reactors have yet been constructed and put into operation in these countries, the stated plans are impressive. The Euratom group alone has proposed a goal of 15,000,000 kws (electric) from nuclear plants by the end of 1967; and the State Department and the Atomic Energy Commission in a recent joint communique stated that this objective "is feasible".

It should be noted, however, that in the countries where power project plans are well advanced difficult financial, technical and legal problems must still be resolved before the realization of those plans can be predicted with confidence. The situation in the countries involved differs from that in the United States only in degree. That other nations are now facing up to these problems in itself is evidence of progress.

Principal political accomplishments have been the negotiation of 43 bilateral agreements for cooperation, the unanimous agreement by an International Conference on the Statute of the International Atomic Energy Agency, and the formulation of regional schemes in Europe, Asia. The political importance

and potential of these activities is very great. The stage has now been reached at which planning must lead to further concrete action if the momentum of the program is to be sustained.

The IAEA project has been a major factor in forcing the U.S.S.R. to abandon an initial negative attitude and to follow the U. S. lead in a world-wide atoms-for-peace plan. Further, the IAEA has maintained one important avenue for peaceful discussion between the West and the East despite the return of many aspects of the cold war. It has thus served as a continuing symbol of peaceful intentions of the United States. The regional programs, particularly in Asia and Europe, promise to put atomic energy at the service of major political objectives -- in Asia, that of tieing the uncommitted countries to those Asian countries more closely associated with the United States, in Europe, that of utilizing atomic energy to further European integration. The Suez crisis has high-lighted the potentialities of nuclear energy in Europe. The extensive bilateral program not only has demonstrated the willingness of the U. S. to assist other nations and thus to bring those nations into closer relationship with us, but also serves as a principal means of developing mutually beneficial arrangements between foreign and U. S. programs. Our success in this respect is evident from Soviet imitation of the U. S. bilateral program.

During the last three years of intense propaganda against nuclear weapons, and especially against testing, the U. S. position has been more acceptable throughout the Free World because of the parallel efforts to spread the benefits of atomic energy. Although it cannot be measured, this accomplishment of the Atoms-for-Peace program is substantial.

The President's proposal of December 8, 1953, gave rise to hopes that this new approach might lead to progress in the long stalled disarmament negotiations. These hopes have not yet been fulfilled. The Soviet Union did not accept the disarmament part of the President's proposal, i.e., that the nations moderate the pace of the nuclear arms race by pooling some weapons material under international control and for peaceful uses.

But there has been a measure of U.S. - Soviet cooperation in Atoms-for-Peace -- though probably not from the same motives. U.S. - Soviet cooperation resulted in the very successful technical conference at Geneva in August 1955. This Conference was proposed by the U. S. and made possible by its massive contributions of technological information. This was the greatest concrete accomplishment of the Atoms-for-Peace program to date. Similar cooperation has resulted in unanimous approval of the IAEA Statute which is based largely on U.S. planning and drafting. This evidence that in spite of the cold war there can exist useful U.S. - Soviet cooperation justifies continued hope that ultimate Soviet recognition of the need for international control of atomic energy will lead to an agreed end to the uncontrolled nuclear threat.

In spite of the failure to progress substantially in the matter of disarmament and the control of nuclear weapons, it is quite possible that the most significant achievement of the U.S. program to date has been the success of the United States in developing an awareness of the vital necessity for international control over the peaceful uses of atomic energy and in taking the first political and technical steps looking toward an acceptable system of control and safeguards against the diversion of nuclear materials and equipment to other than peaceful uses. These steps have been supplemented and strengthened by the safeguard and

control provisions of the bilateral agreements for cooperation.

D. ACCESS TO FOREIGN SOURCE MATERIALS

Domestic production of source material within the United States and firm foreign arrangements (contracts and options) will provide ample material to meet foreseeable or projected requirements through 1966. Beyond 1966, neither domestic nor foreign requirements to be furnished by the U.S. can be clearly determined. Consequently, there is a continuing interest in assuring U.S. access to foreign supplies of source materials. This interest is a principal basis for the foreign exploration assistance program now underway, and will continue to be an objective in the development of the peaceful uses of atomic energy.

E. PREVENTING DIVERSION OF MATERIALS

Extensive provisions relating to safeguards and the control of materials are included in the IAEA Statute, in research and power bilateral agreements, and in the planning of EURATOM and the OEEC. Furthermore, the British have included comparable safeguards provisions in the draft research bilateral with Germany and in the draft power bilateral with Japan. Canada on its own initiative has formally notified governments seeking uranium that Canada plans to require safeguards in uranium sales contracts. An initial approach to the USSR to ascertain whether it also was interested in uniformity of bilateral safeguards produced an evasive response; this matter will be pursued with the USSR if any prospect of success appears.

While attainment of safeguard provisions in the IAEA Statute has been encouraging, provisions of the IAEA Statute must now be translated into an

effective control system with an organization capable of applying them effectively. Since the U.S. has not yet shipped sizeable quantities of enriched material to any one country and no inspection activities have been carried out under U.S. bilaterals, the practical operating problems of implementing the safeguards provisions of U.S. bilaterals have yet to be resolved. It is also not yet clear whether it will be feasible for countries with important atomic energy programs to remain outside a world safeguard system. India appears determined to avoid safeguards and the Soviet Union appears to be endeavoring to tie the satellites to it without any formal bilateral controls of its own or without involving the Soviet Orbit in the IAEA inspection system. Continued positive efforts by the U.S. in the IAEA, together with continued effort to increase world-wide appreciation of the importance of the control problem, will be required to achieve U.S. objectives.

It should be noted that this NSC objective is formulated solely in terms of diversion of "fissionable materials provided to other countries." An equally if not more important element of the control problem now appears to be insuring against diversion of the fissionable material produced as a result of the materials and equipment transferred to the other country.

III. SUMMARY OF ACTIONS

A. REACTOR DEVELOPMENT AND DISTRIBUTION OF MATERIALS.

1. Domestic Development of Atomic Power.

NSC 5507/2, paragraph 24: "As part of an over-all U. S. effort to develop the peaceful uses of atomic energy:

"a. Accelerate the early development of atomic power by the United States."

The stated objective of the AEC's Civilian Power Program is to achieve economic nuclear power production as early as possible, both in the United States and for other cooperating countries. Broadly speaking, the power program consists of three separate efforts: The Experimental Power Reactor Program undertaken at AEC installations, the Power Demonstration Reactor Program undertaken by private industry with AEC assistance in research and development, and programs of individual utilities or groups of utilities undertaken without any direct financial participation by the Government.

(a) Experimental Power Reactor Program. -- This program now consists of 11 projects concerned with the development, design, and construction of ten different types of reactors: pressurized water, boiling water, sodium graphite, fast breeder, aqueous homogeneous, organic moderated, liquid-metal fueled, gas-cooled, molten plutonium, and heavy water-natural uranium. Three additional projects are being studied prior to undertaking research and development. With the exception of the pressurized water reactor, which is a prototype plant, all projects are reactor experiments designed to provide basic information essential to evaluation and development of various types of power plants.

The Experimental Boiling Water Reactor at Argonne National Laboratory went critical on November 30, 1956 and has begun producing power. The plant is designed to produce 20 megawatts of heat and 5,000 kilowatts of electricity. Three other experimental plants and the full-scale PWR prototype (100,000kw)* at Shippingport are scheduled for operation in 1957. The balance of these projects are expected to commence operation by 1960.

(b) Power Demonstration Reactor Program. -- This program enlists private resources in a cooperative effort with Government to demonstrate the technical and economic feasibility of power reactors in a wide range of capacities and design concepts. Starting in January, 1955, the AEC has issued three separate sets of invitations to industry to submit power reactor proposals. The third round of invitations was issued in early January, 1957.

Under the first two rounds, industry and AEC are participating jointly in the development of seven prototype power reactor plants. A definitive contract has been awarded to the Yankee Atomic Electric Company of Boston for a 134,000 electric kilowatt pressurized water nuclear power plant with an estimated completion date in 1960. Four contracts for small power plants (5,000 - 40,000 kw) under the second invitation are being negotiated now.

*Represents expected capacity of second reactor core. First core is expected to produce 60,000 EKW.

Under the recently issued third invitation, no limitation has been placed on the types or sizes of reactors which will be considered. However, all must contribute to economically competitive nuclear power. AEC also expressed a special desire to encourage the construction of power demonstration projects using reactors fueled by (a) natural uranium with a heavy water moderator, and (b) aqueous solutions or slurries of either uranium or uranium and thorium-bearing materials. Construction must be completed by June 30, 1962. In announcing the third invitation, AEC stated that the Commission will request funds to initiate such projects on its own if private industry does not respond.

(c) Privately Financed Programs. -- Eight private industrial and utility organizations or groups are building or propose to build domestic nuclear power plants without any direct financial participation by the Government. In addition, two United States companies operating abroad have proposed the construction of four reactors - three in Latin America and one in the Philippines. Contracts have been awarded for the Latin American reactors, and bids are now being evaluated with respect to the Philippine reactor. Power reactor Agreements for Cooperation necessary to these transactions have not yet been negotiated.

Major construction of the Commonwealth Edison 180,000 kw nuclear power plant and the 140,000 kw Consolidated Edison plant will begin shortly and completion is expected by 1960. A 3,000 kw plant of General Electric and Pacific Gas and Electric is scheduled for completion in 1958.

2. Research Reactor Development.

NSC 5507/2, paragraph 24 b: "Continue activities in the development and application of research reactors."

In addition to the experimental power reactors previously mentioned there are at the present time 8 AEC owned reactors designed wholly or primarily for research operating in the U. S. Three more government-owned research reactors are under construction with scheduled completion dates in 1957. Still another known as the Engineering Test Reactor, is scheduled for start-up this year. Five private research reactors are operating at North Carolina State College, Pennsylvania State University, Aerojet-General Nucleonics, Armour Research Foundation, and Battelle Memorial Institute. Other privately owned research reactors are now under final stages of construction at the University of Michigan and Massachusetts Institute of Technology. Some twenty-nine others are planned for start-up during the period 1957 - 1959, for a total of 36 private research reactors in the United States.

Recent significant developments in the research reactor field include the start of construction of a reactor designed specifically for medical research at the Brookhaven National Laboratory, the operation of the Omega West Research Reactor at the Los Alamos Scientific Laboratory, the development of a privately financed low cost, low power reactor now commercially available, and increasing loans of uranium and neutron sources for use in subcritical reactor assemblies for education and training programs.

Over the past two years there has developed keen commerical competition among U. S. equipment manufacturers selling research reactors both at home and abroad. A recent compilation indicated that some dozen companies are

offering reactors for export, and that an additional eight companies offer varying degrees of design, engineering and construction services in this connection. A table showing research reactors sold abroad by American industry is Appended.

3. Distribution of Nuclear Materials Abroad.

> NSC 5507/2, paragraph 24 c: "Furnish limited amounts of raw fissionable materials (not of weapons quality) required to effectuate 'Agreements for Cooperation' (subject to military requirements for such materials, and recognizing that completion of construction abroad of only a few large-scale reactors is likely before 1960)."

On February 22, 1956, the President, under the Atomic Energy Act of 1954, made available 20,000 kilograms of U-235 for distribution abroad. The total amount of U-235 obligated under current agreements for cooperation and conditionally pledged to the proposed International Atomic Energy is some 11,200 kilograms. This takes into account the so-called "pipe-line" provisions in the agreements which increases the amounts stated in the bilaterals by a factor of three. In addition, to meet these commitments, an additional 2,000 kilograms must be tied up within the United States during conversion and fabrication of fuel elements. The extensive power reactor projects planned abroad, particularly in Western Europe, undoubtedly will lead to further demands which will require an additional Presidential allocation of a substantial amount of material in order for the United States to carry forward its programs of international cooperation and assistance.

On November 18, 1956, the President approved the following terms and conditions under which U-235 will be made available for use abroad:

(1) U-235 will be made available in the form of hexafluoride (UF_6), with the cost of conversion and fabrication to be borne by the user.

(2) The charge for uranium enriched to 20% will be approximately $16.00 per gram (as compared with the price announced on August 19, 1955 of $25.00 per gram). Material of lesser enrichment will be charged at proportionately less amounts. When fuel elements are reprocessed, the cooperating countries will receive a credit for the U-235 recovered.

(3) Material generated in reactors fueled with U-235 obtained from the United States will be purchased by the U. S. at $12.00 per gram for plutonium metal and $15.00 per gram for U-233. Material so purchased will be used solely for peaceful purposes.

(4) In order to give assurance that nuclear fuel will be available for a period roughly equivalent to the economic life of a proposed reactor, and thus facilitate financial arrangements, long-term fuel commitments will be incorporated in agreements for cooperation.

In establishing these terms and conditions the objectives were to place foreign and domestic fuel distribution on the same basis so far as is possible, and to enable cooperating countries to estimate the economics of nuclear power projects, particularly the cost of the fuel cycle. The final principal cost item in that cycle -- the basis for chemical processing contracts between AEC and operators of private reactors -- has now been established and outlined in a public announcement made on March 7, 1957. The policy established, so far as processing costs are concerned, applies equally to foreign and domestic operators.

Except for gram quantities for designated research purposes and limited amounts for materials testing reactors, the uranium allocated for foreign distribution is not of "weapons quality", being limited to twenty percent (20%) contained U-235.

E. DEVELOPMENT OF THE PEACEFUL USES OF ATOMIC ENERGY.

The U. S is the recognized world leader in the development of peaceful uses of atomic energy, according to a special poll conducted by a leading nuclear trade and technical publication of atomic energy authorities, leading

industrialists in the atomic field, educators and other opinion formers and men in the street of eleven foreign countries of the free world.

Of the 102 persons questioned, 75% said the U. S. led in the development of peaceful uses of atomic energy generally, the U.K. received 13% of the first place votes, the USSR was the choice of 10% and 2% of the votes went to other countries.

Fifty-two percent of those questioned thought the U. S. was the world leader in the development of civilian nuclear power. The U.K. was second with 40% and the Soviet Union was third with only 8% of the votes.

The Semi-Annual Report by the OCB on Overseas Effects of U. S. Nuclear Programs dated February 26, 1957 suggests that overseas acceptance of U. S. pre-eminence in atoms-for-peace programs held steady during the reporting period which commenced July 1, 1956. It was pointed out, however, that overseas public reactions to atoms-for-peace programs evidenced a more hard-headed and skeptical attitude toward public statements and a greater desire to see the development of specific programs.

C. CONFERENCES, MISSIONS, AND INFORMATION PROGRAMS

> NSC 5507/2, paragraph 26: "Utilize the U. S. information program and participation in appropriate international conferences (e.g., the 1955 International Conference) to stress the benefits which might accrue from the development of atomic power, while making clear the problems associated therewith."

1. The United States Information Agency is a member of the Inter-Agency Nuclear Coordinating Committee, along with AEC, Department of State, and ICA, and has been very active in disseminating information abroad concerning the "Atoms for Peace" program of the United States. Noteworthy has been the conduct of "Atoms for Peace" exhibits throughout the free world.

2. With respect to conferences, plans are well along for the Second United Nations Scientific Conference on the peaceful uses of atomic energy to be held in September, 1958. A meeting of the Advisory Committee on Atomic Energy to the Secretary General of the U. S., which includes U.S. representation, will be held in May to determine the location of the conference and the agenda. Also significant is the Inter-American Symposium to be held at the Brookhaven National Laboratory in May, 1957 for purposes of clarifying the present and future possible uses of atomic energy in American countries. Invitations will be issued to approximately 100 scientists and other individuals associated with nuclear energy programs in the Americas. This will be the first such symposium to be held in the Western Hemisphere.

A power reactor symposium was held in Belgium in November, 1956 under the sponsorship of the U. S. Atomic Industrial Forum; AEC representatives participated. AEC is planning three additional conferences this fiscal year: Chemical Reprocessing, to be held in Brussels; Raw Materials Exploration, to be held in Lisbon; and Radioisotopes, to be held in Athens. In addition, AEC representatives will attend the joint Japanese-U.S. Atomic Industrial Forum meeting in Tokyo in May.

3. Since the inception of the international program, representatives of foreign countries have made 1224 unclassified visits to AEC installations. In addition, representatives of Belgium, Canada and the United Kingdom have made 332 classified visits. U.S. technical missions, involving over 300 persons, have visited 58 countries to discuss over-all planning of national

programs, economics of nuclear power, selection of power reactor types, research reactors and programs, and the application of isotopes in agriculture, medicine, and industry.

The first "Atoms for Peace Mission" to Latin America, which visited Venezuela, Brazil, Argentina, and Uruguay, was discussed in the last progress report. During November and December, 1956, a similar mission visited Chile, Peru, Ecuador, Colombia, Panama, and Costa Rica. The mission discussed the international program of the United States, disseminated technical information on the use of radioisotopes and radiation in research, research reactors, and nuclear power, and appraised local needs for nuclear training and education. Reports received from the U.S. Embassies in the countries visited indicate that the mission was highly successful.

Visits by specialists have also been made to the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica to discuss a proposed cooperative program calling for the construction of the first gamma field in tropical regions.

Of special importance was the recent visit to the U.S. by the "Three Wise Men" of the EURATOM group, for purposes of discussing the joint needs of the countries of the proposed Community of Six and the possibilities of a permanent association between this Community and the U.S. in the development of atomic energy for peaceful purposes. A high-level technical team from AEC will visit Luxembourg in March to assist the EURATOM Group in developing their program.

The AEC has established offices in Paris and London and the AEC Scientific Representatives will act as technical liaison with foreign atomic energy organizations in implementing agreements for cooperation.

Finally, under the State Department's "leader grant" program, key

atomic energy officials of Latin American countries have an opportunity to visit U.S. officials and AEC installations. The Chairman of the Uruguayan and the Secretary of the Guatemalan Atomic Energy Commission, with their assistants, have visited under this program at U.S. expense.

D. POWER REACTOR ASSISTANCE.

1. Agreements with U.K., Canada, and Belgium. Cooperation with Other Countries.

> NSC 5507/2, paragraph 27 a and b: "Initiate a program of U.S. assistance to other countries in construction of power reactors. To this end
>
> a. Continue current bilateral negotiation of 'Agreements for Cooperation' with Canada, the U.K. and Belgium, which will cover, inter alia, the exchange of information on power reactor technology.
>
> b. Make an early announcement of U.S. readiness to enter into discussions relating to cooperation with other countries in their power reactor planning and programs."

As previously reported, the courses of action directed in these paragraphs have been completed.

2. Power Reactor Agreements

> NSC 5507/2, paragraph 27 c: "Enter into discussions with other free world countries responding to paragraph b above, looking toward 'Agreements for Cooperation' which will cover exchange of power reactor information, and provide in accordance with paragraph 24-c above for the sale or lease or (where sale or lease does not serve the best over-all interests of the U.S.) other transfer of atomic materials or equipment. In such discussions, seek opportunities for maximum U.S. cooperation in those power reactor projects abroad which offer political and psychological advantages."

Agreements for cooperation in the power reactor field providing for an exchange of power reactor technology and for the supply of special

nuclear material for use in power reactors have now been negotiated with eight countries: United Kingdom, Canada, Belgium, Switzerland, Netherlands, Australia, France and Norway. Power agreements are being discussed with 16 additional countries: Argentina, Brazil, Cuba, Germany, India, Israel, Italy, Japan, Pakistan, Philippines, South Africa, Spain, Sweden, Thailand, Tunisia, and Uruguay. Under the recent declassification action it will soon be possible to cooperate fully in the power reactor field on an unclassified basis. This eliminates the need to negotiate security arrangements and expedites the power bilateral program.

Major power reactor projects are being planned in Japan and in Western Europe. Of particular significance is the European cooperative effort known as EURATOM. The Community of Nations in this group is developing large-scale plans for utilizing nuclear power to meet Europe's increasing energy needs. The present objectives are for a program of atomic power development which would bring into service in 1963, and in each year thereafter, 3 million KW of nuclear capacity, for a total of 15 million KW installed by 1967. The United States has indicated that it will cooperate in the EURATOM program to the fullest extent possible, and representatives of the Community have indicated that they look to U.S. industrial resources as essential in the development of their program.

3. Financial Assistance for Power Reactor Projects.

NSC 5507/2, paragraph 27d: "Assistance to foreign governments involving U. S. Government grants in connection with the construction and operation of power reactors shall be in accordance with policies governing U. S. foreign assistance programs and from funds provided for such programs. Beginning with the FY 1957 budget, any foreign assistance funds required for this purpose should be specifically sought."

Except for direct financial support of foreign research reactor projects, U. S. financial assistance is available in the form of Export-Import Bank loans, research and development assistance to U.S. equipment manufacturers, and charges for nuclear fuel comparable to those for domestic users. To date, no Export-Import bank loans have been requested for power reactors. Where grants-in-aid may be required and justified, they will be made in accordance with policies governing U.S. foreign assistance programs, unless otherwise required by law. To date, no funds have been budgeted for granting aid for foreign power reactors.

4. Development in the United States of Power Reactors for use Abroad.

> NSC 5507/2, paragraph 27 e: "Encourage and facilitate the development in the U. S., as rapidly as possible, of power reactors of an appropriate size and design for use abroad, in order to maintain U. S. leadership in this field in the interests of U. S. foreign policy. While private financing should be sought wherever possible as contemplated in paragraph 1 hereof, this course of action will be pursued with the expenditure of public funds where necessary to maintain U. S. leadership."

All work done in the United States on the development of power reactors of all sizes and types has a direct impact abroad. Of particular significance are the reactors being developed and constructed under the second round of the Commission's Power Demonstration Reactor Program, and the reactors to be developed either by private industry or by the AEC under the third round.

In response to its Second Round invitation for small-scale nuclear power plants suitable for export, extended in September 1955, the AEC received 7 proposals for reactors in the range of 5,000 to 40,000 electrical kilowatts. Four of these proposals were accepted and their estimated completion dates

range from 1959-1962. The electrical generating capacity of the proposed plants range from 10,000 to 25,000 kilowatts.

The third round of invitations, described above in Section A1, "Domestic Development of Atomic Power", represents a further significant step in the implementation of this course of action undertaken during the current reporting period, and is responsive to the interest of cooperating countries in reactors utilizing natural uranium fuel cycles.

The AEC has also undertaken a still further step in implementing this course of action by the establishment of a research and development program concerned with (a) heavy water power reactors using natural uranium as fuel, and (b) the feasibility of recycling plutonium in thermo-power reactors. The work on heavy water power reactors is being done by E. I. DuPont de Nemours, Inc. under its contract for the operation of the AEC's Savannah River Plant; and the work on the recycling of plutonium is being done by General Electric under its contract for the operation of the AEC's Hanford plant.

Cooperating countries have shown a varying interest in types and sizes of power reactors, depending upon their energy needs and industrial and technical competence. Present arrangements with American manufacturers range from the 10,000 kilowatt reactor for the Dominican Republic to the 130,000 - 135,000 kilowatt reactor under contingent purchase order by the Edison Volta Company of Milan, Italy. The latter affords a good example of the effect of the impact of the U. S. program on power reactors abroad as it constitutes a duplication of the reactor being developed and designed for the Yankee Atomic Electric Company under the Power Demonstration Reactor Program.

5. Declassification of Atomic Energy Information.

NSC 5507/2, paragraph 27 f: "In furtherance of this policy and in accordance with Sec. 142 of the Atomic Energy Act of 1954, continue the declassification of information on nuclear reactor technology, as security considerations will permit."

Under a revision of the Tripartite Declassification Guide by the U. S., U. K., and Canada, announced in December, 1956, a further large volume of information on civilian use of atomic energy has been authorized for declassification. The actual declassification of documents is now under way on a priority basis and is scheduled to be completed by April 1, 1957. This is the second program of this type undertaken in the past two years.

Most significant for the international program will be the release of all information essential to the design, construction, and operation of civilian power reactors. The U. S. will then be able to cooperate fully in the power reactor field on an unclassified basis.

6. Participation by Private Industry in U.S. Atomic Power Activities Abroad.

NSC 5507/2, paragraph 27 g: "Encourage and facilitate participation of U. S. individuals, industry and private institutions in atomic power activities abroad, such encouragement to include governmental arrangements and authorizations as required by the Atomic Energy Act of 1954."

Under announced Commission policy, U. S. industry is encouraged to play a leading role in the implementation of Agreements for Cooperation. Government-furnished services and materials are made available to cooperating countries only when the required services or materials are unobtainable commercially.

Since the adoption of the new declassification policy, the major area still reserved to the government is the distribution of special nuclear materials. This is required by law. AEC is encouraging private industry to develop chemical processing services, but will continue to provide these services until they become commercially available. Prior to October 1955, industrial firms were required to obtain specific authorization from the Commission to furnish services and materials to foreign nations even on an unclassified basis. As industrial activity grew and the amount of unclassified information increased, the Commission announced a general authorization for unclassified activities abroad on the part of industrial firms. This general authorization will increase in importance as, in accordance with present policy, power reactor technology is declassified. American industry under the general authorization has embarked on an active commercial program.

During 1956, the classified authorization program completed its first year. In this period 18 authorizations were granted for activities in the three countries with which the United States has effective agreements permitting the exchange of classified information.

Previous sections of this report have referred to additional governmental arrangements encouraging U.S. industrial participation abroad, such as availability of fuel, long-term commitments, purchase of plutonium, and the chemical reprocessing of spent fuel elements.

E. NUCLEAR PROPELLED MERCHANT SHIP

NSC 5507/2, paragraph 28: "Make an urgent study, including estimates of cost and time of completion, of installing at the earliest possible date a nuclear reactor propulsion unit

in a U. S. merchant ship, which ship might travel throughout the free world to dramatize the U. S. program for developing peaceful uses of atomic energy."

On October 15, 1956, the President directed the Maritime Administration and the Atomic Energy Commission to proceed as rapidly as possible with design and construction of the first nuclear powered merchant ship. The reactor system for this ship will be of an advanced pressurized water design, and negotiations are completed with the Babcock and Wilcox Company to build the nuclear propulsion plant, 20,000 shaft horse-power, on a lump-sum basis. The ship itself will be a combined passenger-cargo type 595 feet in length, 78 foot beam, and with a capacity for carrying some 100 passengers. Negotiation for the design of the vessel is nearing completion. A Yard Survey Board has completed a review of shipyards qualified and interested in the construction of the ship. It is estimated that the vessel will stand out to sea in FY 1960.

Preliminary studies indicate that application of nuclear energy to the propulsion of tankers offers early achievement of economic operation. All promising systems are now under intensive study. In addition, design and feasibility studies are under way for the selection of more advanced systems.

A study of the operational problems associated with nuclear powered merchant ships is now under way. Preliminary discussions have been held with the Navy, Coast Guard, Coast and Geodetic Survey, and other governmental and private groups concerned with the program.

F. RESEARCH REACTOR ASSISTANCE

NSC 5507/2, paragraph 29: "Initiate a program of aid in construction of research reactors in selected countries, under 'Agreements for Cooperation' which will cover

exchange of information, and provide, in accordance with paragraph 24-c above, for the sale, lease or other transfer (whichever is in the best over-all interests of the U.S.) of atomic materials and equipment."

Agreements for Cooperation covering research reactors have been negotiated with the following 33 countries: Argentina, Austria, Brazil, Chile, China, Colombia, Costa Rica, Cuba, Denmark, Dominican Republic, Germany, Greece, Guatemala, Iran, Ireland, Israel, Italy, Japan, Korea, Lebanon, Netherlands, New Zealand, Pakistan, Peru, Philippines, Portugal, Spain, Sweden, Switzerland, Thailand, Turkey, Uruguay, and Venezuela.

In addition, discussions are in progress with Ceylon, Haiti, Liberia, Nicaragua and Iraq.

The power agreements negotiated with 8 countries also cover research reactors.

Twelve (12) cooperating countries have awarded contracts to six (6) American equipment manufacturers for the construction and installation of sixteen (16) research reactors. See table attached for details.

Present policy provides for the lease of enriched fuel for use in research reactors abroad.

G. TRAINING AND EDUCATION

NSC 5507/2, paragraph 30: "Continue training and educational exchange activities, such as reactor training courses for foreign students."

The program to train technically competent foreign nationals for foreign atomic energy programs has been expanded since the previous progress report.

The 53rd basic radioisotope technique course offered by the Special Training Division, Oak Ridge Institute of Nuclear Studies, opened in September, 1956, with an enrollment of 15 U. S. scientists from 12 states and 15 scientists

from 13 foreign countries.

The International School of Nuclear Science and Engineering at the Argonne National Laboratory, in cooperation with North Carolina State College and Pennsylvania State University, through February, 1957, has graduated 162 students -- 116 of whom have been from 34 foreign countries.

A U. S. program sponsored at the University of Puerto Rico is expected to begin with the 1957-58 academic year. This program will be for Latin-American students and will be conducted in the Spanish language by the University under contract with the Atomic Energy Commission's Oak Ridge Operations Office. Facilities for training programs in reactor physics and in the use of radioisotopes in various fields of research will be furnished and will include a research reactor, a subcritical facility and, at a later date, possibly a training reactor. These facilities will serve as a nucleus for a comprehensive educational and research program in pure and applied nuclear sciences at the University.

A four-fold program to assist the Inter-American Institute of Agricultural Sciences is being organized by the Commission: (a) Offering training at the Oak Ridge Institute of Nuclear Studies and Brookhaven National Laboratory for staff members selected by the Director of the Institute at Turrialba; (b) providing equipment for a radioisotope laboratory; (c) supplying a radiation source (cobalt 60) for plant irradiation in the field, radioisotopes, if desired, and help in the technique of using these tools; and (d) providing irradiation of plants and seeds for experiments as requested.

Under the educational exchange program, the Department of State continues to sponsor and facilitate the exchange of lecturers, specialists and research scholars in the field of nuclear science. The International Cooperation Administration, in addition to assisting foreign participants in the International School of Nuclear Science and Engineering and the radio-

isotope technique course at the Oak Ridge Institute of Nuclear Studies, is supporting the training at U. S. Universities of foreign technologists in the application of nuclear energy techniques. The Atomic Energy Commission has made special arrangements to provide foreign scientists with on-the-job training at the Brookhaven and Argonne National Laboratories, and to provide training in health-safety matters.

H. INTERNATIONAL ATOMIC ENERGY AGENCY

> NSC 5507/2, paragraph 31: "Take the necessary steps to proceed with the organization of an International Atomic Energy Agency which will be brought into an appropriate relationship with the United Nations.
> paragraph 32: "If U. S. participation in a satisfactory International Atomic Energy Agency is negotiated, utilize and support such Agency as an instrumentality in the field of atomic power as well as in the fields of training, information, isotopes and research reactors, and be prepared to support its operations with limited amounts of fissionable material."

At one of the largest and most significant conferences in the history of international cooperation, the Statute of the International Atomic Energy Agency was approved in New York on October 26, 1956. The creation of the IAEA, which now awaits only the necessary ratification, will constitute the most important single step in the implementation of the proposal advanced by the President in his United Nations address of December 8, 1953.

A Preparatory Commission for the IAEA is now detailing the organization and the substantive program of the Agency. United States proposals provide for an Agency which will be active in all phases of the peaceful uses of atomic energy. Although there may be some delay, the target date for the first General Conference of the IAEA is August 1957, by the first year, it is expected that the work of the Agency will consist for the most part in planning its activities.

At the closing session of the International Conference, the Chairman, Atomic Energy Commission, read a statement by the President that the United States would make available to the International Agency, on terms to be agreed with the Agency, 5,000 kilograms of U-235 from the 20,000 kilograms of such material allocated for peaceful uses abroad. It was stated that the United States, in addition to the above mentioned 5,000 kilograms of U-235, will continue to make available to the International Agency nuclear materials that will match in amount the sum of all quantities of such materials made similarly available by all other members of the International Agency, and on comparable terms for the period between the establishment of the Agency and July 1, 1960. The United States will furnish these nuclear materials as they are required for Agency-approved projects.

I. SAFEGUARDS AND CONTROLS AGAINST DIVERSION TO OTHER THAN PEACEFUL USES

> NSC 5507/2, paragraph 33: "To safeguard against diversion of fissionable materials to non-peaceful uses, ordinarily require:
>
> "a. Chemical processing of used fuel elements in U. S. facilities or under acceptable international arrangements.
>
> "b. Adequate provision for production accounting, inspection and other techniques."

The U.S. continues to require in its bilateral agreements the safeguards and control provisions detailed in the previous report. In addition, the U.S. representatives at the International Conference assumed leadership in obtaining agreement to similar safeguards in the approved treaty of the International Agency. The unanimous acceptance of these safeguards in the International Agency framework indicates an increased understanding throughout the world of the importance of preventing a diversion of materials. Implementing action by the Agency should contribute further to this understanding.

APPENDIX

FOREIGN RESEARCH REACTORS SOLD ABROAD

Country	Location	Type of Reactor	Reactor Manufacturer
Brazil	Sao Paulo	Pool Type	Babcock & Wilcox Co.
Denmark	Riscoe	Pool Type	Foster Wheeler Corp.
Denmark	Riscoe	Water Boiler	Atomics International
Greece	near Athens	Pool type	AMF Atomics, Inc.
Italy	near Milan	D_2O tank type	ACF Industries
Japan	Tokyo	Water Boiler	Atomics International
Japan	Tokai-Mura	D_2O tank type	AMF Atomics, Inc.
Netherlands	(Undertermined)	Tank type	ACF Industries
Netherlands	Amsterdam	Pool type	AMF Atomics, Inc.
Spain	Madrid	Pool type	International General Electric
Sweden	Studsvik	Tank type	ACF Industries
Venezuela	near Caracas	Pool type	International General Electric
West Germany	Munich	Pool type	AMF Atomics, Inc.
West Germany	Hamburg	Pool type	Babcock & Wilcox Co.
West Germany	University of Frankfurt	Water Boiler	Atomics International
Berlin	Berlin (U.S. Sector)	Water Boiler	Atomics International

PART IV - REVISION OF POLICY

NSC 5507/2, dated March 12, 1955, developed in the months following the approval of the Atomic Energy Act of 1954 and now over two years old, established policies under which the United States has been able to develop broad and effective programs of international cooperation in the peaceful uses of atomic energy -- both bilaterally and multilaterally. It is no criticism of NSC 5507/2 to note that many of its provisions are now outdated and that the dynamic situation which has developed throughout the world indicates the need for thorough revision. It is therefore recommended that such a revision, under direction from the National Security Council, be drafted by the Chairman, Atomic Energy Commission, and the Secretary, Department of State, for submission to the Council under procedures and time schedules to be developed in consultation with the National Security Council Planning Board.

PART V - SEPARATE VIEWS OF THOMAS E. MURRAY, COMMISSIONER, U. S. ATOMIC ENERGY COMMISSION

In my view progress in the development of industrial atomic power is not adequate to carry out the directive NSC 5507/2 as it pertains to this aspect of the peaceful uses of atomic energy. That is, progress has not been sufficient to insure fulfillment of that stated program objective of NSC 5507/2 which is:

> "To maintain United States leadership in the development of the peaceful uses of atomic energy, particularly atomic power."

I expressed similar views in connection with a Commission report made last year to the National Security Council. In a separate letter to Mr. Dillon Anderson dated August 3, 1956, I stated my belief:

(a) "That, if it is important to meet world needs for atomic power, then the Government must take the responsibility for the construction of large size power reactors in the years immediately ahead", and

(b) "That the only industrial /atomic/ electric power produced in large quantities by 1960 will be that from the Shippingport reactor."

It continues to be apparent to me, as it has been during the almost two years this directive has been in effect, that the Commission's present policies and programs are not adequate to carry out the intent of Paragraph 24(a):

"Accelerate the early development of atomic power by the United States."

And Paragraph 25:

> "Carry forward the development of the peaceful uses of atomic energy as rapidly as the interests of the United States dictate, seeking private financing wherever possible."

These inadequacies can only be rectified by immediate construction of a few large reactors of different types. My most recent proposal for such a program of reactor construction was made before the Joint Committee on Atomic Energy at hearings held on February 19, 1957, pursuant to Section 202, Atomic Energy Act of 1954.