INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

HEARINGS

BEFORE THE

SUBCOMMITTEE ON AGREEMENTS FOR COOPERATION

OF THE

JOINT COMMITTEE ON ATOMIC ENERGY

CONGRESS OF THE UNITED STATES

EIGHTY-NINTH CONGRESS

SECOND SESSION

ON

INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

JANUARY 27, MAY 26, JUNE 28, AND AUGUST 25, 1966

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INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

THURSDAY, JANUARY 27, 1966

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON AGREEMENTS FOR COOPERATION,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C.

The subcommittee met at 10 a.m., pursuant to call, in room AE–1, the Capitol, Senator Albert Gore (chairman of the subcommittee) presiding.

Present: Senators Gore, Hickenlooper, and Bennett; and Representatives Hosmer and Anderson.

Also present: John T. Conway, executive director; Edward J. Bauser, assistant director; Leonard M. Trosten, staff counsel; George F. Murphy, Jr., national security affairs; James B. Graham, technical adviser; and William T. England, professional staff member.

PROPOSED CIVIL AGREEMENTS FOR COOPERATION WITH INDONESIA, SPAIN, AND SWITZERLAND

Senator GORE. The subcommittee will be in order.

Today's meeting of the Subcommittee on Agreements for Cooperation is for the purpose of considering a proposed superseding agreement to the agreement for cooperation with the Government of Switzerland as well as proposed amendments to the agreements for cooperation with the Republic of Indonesia and the Government of Spain. All three agreements concern civilian uses of atomic energy.

In accordance with normal committee procedure, copies of these proposed agreements and supporting correspondence were inserted in the Congressional Record of January 20, 1966, in order to inform Congress and the public of the pendency of these matters.

Without objection, I will insert at an appropriate point in the record of this hearing copies of these materials together with the brief statement relative thereto which I made on the floor of the Senate in submitting them for publication in the Record.

(The statement referred to is set forth below; the texts of these agreements and their supporting correspondence are set forth in app. 1, p. 121.)

[Reprinted from Congressional Record of Jan. 20, 1966, p. 720]

PROPOSED AMENDMENTS TO AGREEMENTS FOR COOPERATION WITH INDONESIA, SPAIN, AND SWITZERLAND

Mr. GORE. Mr. President, as chairman of the Subcommittee on Agreements for Cooperation of the Joint Committee on Atomic Energy, I wish to inform the Senate that pursuant to section 123(c) of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to the Joint Committee proposed amendments to the agreements for cooperation with the Governments of Indonesia, Spain, and Switzerland concerning peaceful uses of atomic energy. The proposed amendment to the Spanish agreement was received by the Joint Committee on December 1, 1965, and the proposed amendments to the Indonesian and Swiss agreements were received on January 12, 1966.

The proposed amendment to the Indonesian agreement, which expired on September 20, 1965, would extend the life of the agreement for 5 years. This would be a research-type agreement concerning peaceful uses of atomic energy, providing for such matters as exchange of information, lease of enriched uranium as fuel for research reactors, and the sale of relatively small quantities of fissionable materials for use in defined research projects. The agreement would provide for safeguards to assure that materials and facilities subject to the agreement are used only for peaceful purposes, and that arrangements be made for assumption of safeguards responsibilities by the International Atomic Energy Agency.

The amendments to the Spanish and Swiss agreements would, among other things, provide for long-term supply of fuel for these nations' nuclear power programs, and also that arrangements be made for assumption of safeguards responsibilities by the International Atomic Energy Agency.

Section 123(c) of the act requires that these proposed amendments lie before the Joint Committee for a period of 30 days while Congress is in session before becoming effective. It is the general practice of the Joint Committee to publish proposed civilian agreements for cooperation in the Record and to hold public hearings thereon.

In keeping with this practice, I ask unanimous consent to have printed at this point in the Record the text of the proposed amendments to the agreements for cooperation with Indonesia, Spain, and Switzerland, together with supporting correspondence.

Senator GORE. I think it would also be appropriate to include in this record copies of the notes exchanged earlier by the United States and Indonesian Governments in which Indonesia recognized the continuing effect of the safeguards provisions of the agreement which expired last September.

We would be appreciative, therefore, if the State Department would authorize the committee to make public copies of the notes. Copies were made available to the committee by letter dated October 28, 1965, but were marked "Confidential" pending approval of extension of this agreement. (See app. 2, p. 174.)

Mr. Palfrey, I understand that you will be our first witness. Please proceed.

STATEMENT OF JOHN G. PALFREY, COMMISSIONER; ACCOMPANIED BY MYRON KRATZER, DIRECTOR, DIVISION OF INTERNATIONAL AFFAIRS; AND DWIGHT INK, ASSISTANT GENERAL MANAGER, ATOMIC ENERGY COMMISSION

Mr. PALFREY. It is a pleasure to be here at this meeting of the Joint Committee to testify on the proposed agreements with Spain, Switzerland, and Indonesia.

With me this morning are Mr. Kratzer and Mr. Ink. With your permission, I would propose to comment in my initial statement upon all three of the agreements which are before the committee.

SPANISH AND SWISS AGREEMENTS

Two of the agreements, those with Spain and Switzerland, lend themselves to joint coverage—even though the former is an amendment and the latter a superseding agreement—because they follow a somewhat new format and contain similar features.

As has been our policy in extending agreements over the past several years, both of the agreements provide for the assumption by the International Atomic Energy Agency of safeguard responsibilities for materials and equipment transferred under the agreements. These two cases, however, have particular significance in view of the size of the power reactor programs contemplated by the two countries. These programs will be the largest yet committed to the Agency's safeguards system.

Both agreements were developed because of the intention of Spain and of Switzerland to undertake the development of nuclear power programs and their consequent desire to obtain long-term assurances as to the availability of fuel for the reactors which they plan to construct under those programs. The agreements, therefore, are both long-term and both provide for the transfer of increased quantities of U^{235} calculated to meet the long-term power programs, as well as the research activities, of the two countries. In the case of Spain, the net amount of U^{235} available for transfer would be increased to 8,500 kgs. and in the case of Switzerland to 30,000 kgs. Both agreements contain annexes in which are listed the power reactors which are planned for construction and for which fuel material would be made available under the new agreements. U.S. companies have been successful bidders for all three of the reactors for Spain. In the case of Switzerland, a U.S. company has been selected for the 350 MWe NOK reactor and bids for the 600 MWe ATOM-ELECTRA have been submitted by two such companies.

TOLL ENRICHMENT SERVICES

In accordance with the private ownership legislation of 1964, both agreements would enable the AEC to provide toll enrichment services after December 31, 1968. In order to account realistically for the transfers of U^{235} into and out of the United States in the process of providing toll enrichment services, the proposed agreements contain a revised method of determining the net amount of enriched uranium transferred.

Briefly, the net amount, for purposes of either debiting or crediting, would be the difference between the quantity of U^{235} in the enriched uranium transferred and the quantity of U^{235} contained in an equal quantity of uranium of normal isotopic assay.

In keeping with the practice of a number of other agreements, both the Spanish and Swiss agreements would also permit the AEC to make available a portion of the enriched uranium supplied under the agreements as material enriched to greater than 20 percent in the isotope U^{235} when there is a technical or economic justification for doing so. Such transfers could take place only at the discretion of the Commission. This change would permit both Switzerland and Spain to receive 93 percent enriched material for research and materials testing reactors, rather than 90 percent material as is currently the

case. The standard enrichment now being produced is 93 percent and the special steps involved in supplying 90 percent material result in additional cost to the recipient and an inconvenience in the fabrication operations.

These are the significant points common to the two agreements. If I may, I would now like to comment upon some of the major individual features of the agreements.

DON REACTOR PROJECT

Turning first to the Spanish amendment, article III.A. would permit the loan as well as the lease or sale of enriched uranium for defined research applications, including reactor prototypes. Article IV would modify the present agreement to permit the sale, lease or, subject to required governmental authorization, loan of other materials, including heavy water. These changes are designed to reflect the proposed cooperative arrangement which the Commission has under consideration with the Spanish Junta and under which the initial heavy water and enriched uranium required for the DON reactor would be loaned to Spain over a 5-year period. We have made clear to the Spanish Junta that this language is permissive and not obligatory and that our ability to enter into such an arrangement with Spain is dependent upon specific governmental approval, including congressional authorization. The Spanish Government has not yet approved the DON project. Consequently, no decision has yet been made on the timing and nature of the submission which would be made to the Congress in seeking its approval for the loan arrangement.

The proposed Swiss agreement is presented as a superseding agreement rather than an amendment. This is due in part to the scope and long-range nature of the provisions requested by Switzerland. Also, as was noted in our letter to the Joint Committee of January 12, 1966, the cooperative activities in research conducted under the 1955 research agreement with Switzerland, were brought under the terms of the existing power agreement and the 1955 agreement was allowed to expire. The superseding agreement will accordingly permit the continuation of cooperation in research, as well as activities initiated under the power agreement. Under the new agreement all exchanges would be on an unclassified basis.

TOLL ENRICHMENT SERVICES

Pursuant to the private ownership legislation, the Swiss agreement provides for authorized private parties in the United States and Switzerland to make arrangements for the transfer of special nuclear and other materials to the Swiss Government or to authorized private parties in Switzerland. The Commission will have discretion over such transfers by virtue of the requirement that they accord with the applicable laws, regulations, policies and license requirements of the United States. The amounts of material so transferred will be charged against the total quantity available under the agreement.

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIALS

As the committee will recall, the Commission published for comment in the Federal Register, on September 21, 1965, proposed amendments to our regulations. The intent of the Commission in authorizing private transactions is to exercise through the licensing procedure the same basic determinations regarding the eligibility of a project to receive materials as are currently used for government-to-government transactions. We would envisage that the licensing of transactions would be used in order to simplify the procedural aspects of transfers and would be particularly helpful to U.S. firms which provide complete fuel supply services and maintain inventories of materials.

INDONESIAN AGREEMENT FOR COOPERATION

The third agreement before the committee is the amendment to the existing Agreement for Cooperation with Indonesia. The purpose of this amendment is to extend the agreement for a period of 5 years and to provide that the International Atomic Energy Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this agreement.

EXCHANGE OF NOTES CONCERNING SAFEGUARDS

As the committee is aware, the agreement with Indonesia expired on September 20, 1965. Because of the political situation in Indonesia last year a decision on whether to proceed with an extension of the agreement was held in abeyance until mid-August 1965. At that time it became obvious that the time remaining was not sufficient to permit completion of the steps necessary to effect an extension prior to the expiration date of the agreement. Accordingly, at our request, the Government of Indonesia provided a formal note on September 20, 1965, stating that it recognizes the continuing effect of the safeguards and guarantees provisions of the agreement pending the coming into force of the amendment extending the agreement. (See app. 2, p. 174.)

U.S. SAFEGUARDS INSPECTION IN INDONESIA

In that connection our inspections have been entirely satisfactory, and in fact one U.S. inspection was carried out only yesterday.

As the committee knows, cooperation with Indonesia under the agreement is on an unclassified basis. Construction of the 250-kilowatt Triga research reactor at the Bandung Institute of Technology was completed in 1965. This reactor is fueled with 2.438 kilograms of 20 percent enriched material. Additionally, 3 grams of U^{235} were provided for use in two fission counters.

IAEA SAFEGUARDS

We consider that the future transfer of safeguards functions to the IAEA, as contemplated in the proposed amendment, would be a desirable and significant step in the application of international safeguards. We would expect, and believe that we should be prepared on our part by extending the agreement, to continue the accept-

able relationship which has existed with Indonesia in the field of peaceful uses of atomic energy.

Mr. Chairman, this concludes my prepared statement. I shall be pleased to answer whatever questions members of the committee may have, or perhaps you would like to hear Mr. Pollack first.

Senator GORE. I think we will hear the State Department first and then proceed to questions.

Before you do so, Mr. Pollack, I would like to advise you that it is customary for witnesses coming before this committee, and other committees of Congress, to furnish the committee with advance copies of the prepared testimony they plan to deliver. Your office was notified last Friday that a State Department witness was expected to appear here today and your office was specifically requested early yesterday afternoon to deliver a copy of your statement, either by 6:30 p.m. last night, or at 8 a.m. this morning. I recognize that we have had a snow, and we will forgive you this time, but let me point out we did not receive your statement until the start of this morning's session.

Is there some explanation other than the weather?

Mr. POLLACK. None.

Senator GORE. Will you proceed.

STATEMENT OF HERMAN POLLACK, ACTING DIRECTOR OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL AFFAIRS, AND DONOVAN ZOOK, OFFICER IN CHARGE, ATOMIC ENERGY AFFAIRS, DEPARTMENT OF STATE

Mr. POLLACK. I am happy to have the opportunity to appear before the committee and to testify for the Department of State on the proposed agreements with Spain, Switzerland, and Indonesia.

IAEA SAFEGUARDS

These three agreements, different as they are in other respects, do share in common one important feature to which the Department, in cooperation with the Atomic Energy Commission and this committee, has attached great importance. This is the agreement between the U.S. Government and each of the other three Governments to transfer to the International Atomic Energy Agency responsibility for the controls and on-site inspections designed to insure against the diversion to military purposes of assistance made available for peaceful purposes. These three agreements represent a significant expansion of our reliance on the IAEA safeguards system as a fundamental instrument of our foreign policy in the international scientific field.

SPANISH AND SWISS AGREEMENTS

The agreements with Spain and Switzerland have the additional importance of representing potentially sizable nuclear power programs which will come under the Agency's safeguards system.

Aside from these safeguards considerations, the Department attaches great importance to the agreements with Spain and Switzerland as evidences of the growing significance of nuclear energy as a source of electrical power. These agreements emphasize the role

that the United States and U.S. industry constantly play in this development.

INDONESIAN AGREEMENT

The amendment to the agreement with Indonesia extends that agreement for a period of 5 years and provides for the transfer of the safeguards responsibilities to the IAEA. Since September 20, 1965, the safeguards and guarantees provisions of this agreement have continued in effect under an exchange of notes with the Government of Indonesia, as this committee has previously been informed. Otherwise, the amendment makes no change in the original agreement.

It is the Department's view that the foreign policy objectives of the United States are well served by all three of the agreements before the committee today.

Thank you, Mr. Chairman.

Senator GORE. Congressman Anderson, do you have any questions?

Representative ANDERSON. I have a question which does not relate strictly to the agreements with the countries mentioned this morning, but it does relate, I think, to this general area of expanding sales of American reactors and growing demand in European countries for nuclear power. If I have the Chair's permission, I would like to ask it?

Senator GORE. You may proceed.

REACTOR SALES TO COMMUNIST BLOC COUNTRIES

Representative ANDERSON. It relates to a story which was published, and I don't know whether this was the first occasion or not, last November, to cite one example. An article appeared in the Christian Science Monitor under date of November 6, 1965, saying that diplomatic sources and British informants have disclosed a secret allied decision authorizing sales of nuclear power reactors that would be used for peaceful purposes by Communist countries of Eastern Europe.

The story goes on to mention some of the Soviet satellites like Rumania and Czechoslovakia and Poland, and to state that there has been an agreement made that exceptions will be permitted to the present COCOM, or Coordinating Committee procedures, whereby the sale of nuclear reactors is barred to satellite countries.

We have a representative of the State Department here this morning, and I would like to have his comment on that article and other similar stories that have appeared in recent weeks.

COORDINATING COMMITTEE (COCOM)

Mr. POLLACK. Sir, it is my understanding that the COCOM organization has reached a procedural decision that would permit the sale of reactors under the condition that appropriate safeguards would be applicable.

Representative ANDERSON. Those are IAEA safeguards?

Mr. POLLACK. I am not clear that it specifies those. I understand it does specify those safeguards.

Representative ANDERSON. As I understand, the rule of unanimity prevails within COCOM and if any one of the 15 member

countries—or however many there are, something like 15, I guess, that belong to the organization—if any one country disagrees, then the others are honorbound not to proceed with any shipment or with any agreement; is that correct?

Mr. POLLACK. Sir, I just am not familiar with the arrangement.

Mr. KRATZER. COCOM does operate on the basis of a rule of unanimity.

Representative ANDERSON. In other words, if an agreement has been reached to provide for procedures where exceptions would be permitted to the present ban on the sale of nuclear reactors to Soviet satellite countries, this, then, is another way of saying that the United States, as a member of COCOM, has agreed to a policy of permitting such exceptions, if IAEA safeguards are observed by the country to whom the reactor would be sold.

Mr. POLLACK. Each case would be considered on its individual merits. Actually, the agreement is to consider the making of the sale, rather than any agreement in advance that sales would be permitted subject to IAEA safeguards.

Mr. PALFREY. It is the removal of the automatic exclusion from consideration. It is no commitment in advance that we would at a given time decide to provide a reactor, simply because the request has been made for us to provide a reactor.

Representative ANDERSON. That is the way these things generally start. That is the first step in the general relaxation of any kind of a ban or embargo. I suppose it is where you start to say you are going to give sympathetic consideration. Then the sympathy grows on you as time goes on, and as the pressure—I presume from countries like Britain and others who might be interested in making these export sales—intensifies.

Mr. PALFREY. I presume it also represents the feeling that the imposition of international safeguards beyond the Western orbit would be a significant development.

Representative ANDERSON. I don't want to get into an extended polemic on this thing, but there is really more involved than the question of safeguards, it seems to me. It is the whole area of the communication of valuable technical information and technology, and advanced technology.

Presumably, a lot of other things that are on the COCOM list and that are barred are there for that same reason, that we don't want to communicate any advanced technology and strategic information to the other side.

I am just a little bit surprised, frankly, as one member of this committee, that we can leap over that barrier so quickly in deciding we are now going to give sympathetic consideration to these requests for exceptions to the present procedure.

Mr. PALFREY. All I am saying is that if any specific proposal does come from an Eastern European country, it would be considered solely on its merits, and obviously presented and examined before this committee and elsewhere in the total context of what we are trying to accomplish.

REACTOR SALE TO RUMANIA

Representative ANDERSON. I wonder if either Mr. Pollack or you, Mr. Palfrey, could tell the committee what our policy or position would be, then, with respect to the much talked about sale of a reactor to

Rumania. This has been mentioned, I think perhaps more frequently in the press and public than any other place.

Mr. PALFREY. I don't think this has reached the point where it could be answered.

Representative ANDERSON. Would you care to respond to that question, Mr. Pollack?

Mr. POLLACK. I would have to respond in a comparable fashion. I don't think the policy has been established on this point.

Representative ANDERSON. Where does that leave us, then, really, with respect to this whole matter of the COCOM ban? Is it simply that we will consider it sympathetically, quote and unquote?

Mr. POLLACK. I don't believe the word "sympathetically" is appropriate here. The individual proposals for sales of reactors to countries now under ban would be considered individually on their merits at the time that the proposals come forward.

Representative ANDERSON. That phrase, "on its merits" is kind of an illusive one. Presumably, I guess, all of these things are decided on their merits.

What is the attitude of some of our partners in COCOM on this—the British, for example? Are they the ones who are pressing particularly hard for relaxation of this restriction or ban?

Mr. POLLACK. I regret I just don't know the individual views of the members of COCOM on this.

Representative ANDERSON. Doesn't this fall in your particular area, Mr. Pollack, this whole question of what our policy should be with respect to COCOM and the sale of reactors?

Mr. POLLACK. The question of reactors is within my jurisdiction, but the question of COCOM and trade with the countries of Eastern Europe are principally in the area of the Economic Bureau, and the European Bureau.

Representative ANDERSON. What is the latter one?

Mr. POLLACK. The Economic Bureau and the European Bureau of our Department. Should such a proposal reach the point where a discussion is warranted, of course, we will be before this committee and review the merits of it with the committee.

Representative ANDERSON. But to your knowledge, there is no policy at the present time on the part of the U.S. Government and specifically the Department of State, with respect to this matter of the sale of nuclear reactors to countries in Eastern Europe, satellite countries?

Mr. POLLACK. That is correct.

Representative ANDERSON. Do you know if there have been any meetings or discussions between representatives of our Government and representatives of Eastern European governments on this question?

Mr. POLLACK. There have been conversations on the question of the U.S. interest in the sale of a reactor to one or the other of the countries. That has been broached, but not in the sense of a formal meeting for the purpose of discussing this.

Representative ANDERSON. Can you be any more specific with respect to what countries you might be talking about when you state there have been meetings?

Mr. POLLACK. No, I don't think that I can, sir.

COCOM POLICY

Mr. CONWAY. If I may, I think you qualified a point that Mr. Anderson did raise on the COCOM matter, and that is, if a country behind the Iron Curtain did ask or want to purchase a reactor and it was for civilian purpose, and they were willing to place it under full International Atomic Energy Agency safeguards, then under the COCOM arrangement you would be obligated, I believe, to sympathetically consider the request.

I think that generally is the policy right now of the members of the COCOM, as I understand it.

Mr. POLLACK. That is not my understanding, but I could be corrected on this. Are we committed to a sympathetic consideration?

Mr. KRATZER. Sympathetic consideration is a part of it.

Mr. CONWAY. I have a letter from the State Department which points out if these conditions are met, then the members of COCOM are under obligation to consider the request "sympathetically." That is as far as it goes. That is the policy.

(The correspondence referred to follows; see also app. 8, p.183:)

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., November 6, 1965.

Mr. DOUGLAS MACARTHUR II,
Assistant Secretary for Congressional Relations,
Department of State, Washington, D.C.

DEAR MR. MACARTHUR: On August 14, 1965, you informed the committee that COCOM had reached a decision in July concerning a revision in the international embargo on export of reactors to the Sino-Soviet bloc. This decision was also the subject of several recent articles in the press.

In this connection, please tell us what procedures will be followed in the event (1) a request is received by one of the COCOM members for export of a reactor to a Communist-bloc nation; and (2) a member of COCOM objects to such a sale. The Joint Committee also wishes to be specifically informed if and when a proposal to sell a reactor to a Communist-bloc nation is presented to COCOM in accordance with the new procedure. Of course, we would also wish to be informed whenever a request is made to the United States for such a sale.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

DEPARTMENT OF STATE,
Washington, November 18, 1965.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CHAIRMAN: Thank you for your letter of November 6, 1965, inquiring about the revision in the Coordinating Committee (COCOM) procedures concerning the embargo of nuclear reactors to the Sino-Soviet bloc to be followed in the event that a question of a COCOM exception arises.

If a member nation of COCOM proposes to sell a reactor to one of the Communist bloc nations, it would under the new procedures as under the old, present the case to the Committee for approval as an exception to the embargo. The COCOM practice is to require unanimous agreement for all exception cases. Thus, the objection of a single member prevents the shipment. Since COCOM is a voluntary organization, there is the remote possibility that a member might decide to ship despite such an objection. This has happened, however, on only one occasion under circumstances where there was disagreement as to the applicability of the COCOM definition to the particular article being shipped.

In the case of reactors, the COCOM agreement of July is to be understood in the following way. The COCOM has set two conditions that must be met before a participating country introduces an exception into the Committee under the

special procedure. These conditions are: first, that the reactor properly falls in the category of being either a civil research or a power reactor; second, that the country desiring to make the purchase has agreed to allow the full safeguards of the International Atomic Energy Agency to be applied. If these conditions are clearly met, the members of COCOM are then obligated to consider the request sympathetically but may take account of other relevant circumstances in reaching their final decision, because each exception request must be individually justified on a case-by-case basis. If a member country decides to oppose a particular exception after considering all the justification offered, it may properly do so under the special procedure, and the rule of unanimity would then operate to rule out the COCOM exception.

A member country might decide to submit an exception request even though there had not been agreement on IAEA safeguards, but rather on some other form of safeguards. In that event, there would be no obligation on the other COCOM members to give sympathetic consideration to the exception, but the case could still be considered on its merits.

In either set of circumstances, it is clear that the COCOM procedures assure that any proposed exception would be given careful individual review and that no COCOM exception would be agreed unless the U.S. Government is satisfied on all the circumstances of the case.

To date no countries have submitted applications for an exception for a nuclear reactor. We will inform the committee if and when a proposal for a reactor sale is presented to COCOM.

The United States has not had a request from a Communist country for sale of a reactor other than the discussion of the subject held last year with Rumania of which you are already aware.

Sincerely,

(Signed) DOUGLAS MACARTHUR II,
Assistant Secretary for Congressional Relations.

INDONESIAN AGREEMENT

Senator GORE. Mr. Palfrey, do I correctly understand that with respect to the agreement with Indonesia, the United States will retain ownership of the fuel but not the reactor that is to be exported or constructed?

Mr. PALFREY. That is correct, Senator.

Senator GORE. Now, in the event that the agreement is terminated and the United States repossesses its fuel, what right, if any, would the United States have, or what obligation, if any, would Indonesia have, regarding the periodic inspection of the reactor?

Mr. PALFREY. The fuel would be returned to the United States, but the reactor would remain in the ownership of Indonesia.

Senator GORE. The agreement with respect to the fuel is terminated?

CONTINUING EFFECT OF SAFEGUARD PROVISIONS

Mr. KRATZER. It is our position, and this has been confirmed on many occasions, including the occasion when the existing Indonesian agreement expired, that these safeguard provisions outlive the agreement. In other words, the guarantee is that the material and the equipment supplied under the agreement shall not be used for any military purpose, and we mean by that that it shall never be used for any military purpose.

Mr. CONWAY. Is that the material, or the equipment as well as the material?

Mr. KRATZER. I am reasonably confident that you will find that the notes that we exchange do refer both to the materials and the equipment.

Senator GORE. Will you reinforce your memory in that regard and let the record so show?

Mr. KRATZER. Yes, sir.

(See app. 3, p. 175.)

IAEA SAFEGUARDS

Senator GORE. Our records indicate that when the IAEA's Administrative and Legal Committee approved the Agency's recently revised safeguards system, the only nation to vote against approval was Indonesia. What was Indonesia's announced reason for opposing this improved procedure?

Do you foresee any difficulties in obtaining Indonesian compliance with this procedure under the proposed new agreement with us?

Mr. KRATZER. Mr. Chairman, my recollection is that Indonesia's reason was that they felt that the controls were unnecessarily strict, but that they did intend, and I am sure it was part of their statement of explanation of their vote, to comply with them, I am quite sure that they will.

As Mr. Palfrey's testimony indicated, their cooperation with our inspectors has been quite good and we have every reason to feel that this will continue to be the case.

Senator GORE. Of course, there has been some change in the structure of the Indonesian Government in the last few weeks or months. Have you noticed any bearing upon this agreement as a result of this?

U.S. SAFEGUARDS INSPECTION IN INDONESIA

Mr. KRATZER. One of our inspections was carried out under the previous structure, and the one just now completed under the present structure, and they were both quite satisfactory, not only in terms of the results, but in terms of the cooperation extended to the inspectors. From our point of view, I don't think that we noticed a difference.

Mr. PALFREY. It had some bearing on our considerations on the extension of the agreement—and I do think it is important to emphasize—that as in some other countries, the civil uses cooperation in the atomic field seems to have survived the vacillations of political relationships. I think this is a valuable asset.

Would you have any comment?

Mr. POLLACK. I concur in that.

OTHER REACTORS IN INDONESIA

Senator GORE. What other nuclear reactors are located in Indonesia?

Mr. KRATZER. There is a Soviet reactor, a research reactor, and a subcritical assembly in Indonesia. My understanding is that the reactor is still under construction. It is a very small unit, although not as small as ours.

Senator GORE. Was it, when it was in operation, subject to the safeguards?

Mr. KRATZER. The Soviets have not required safeguards on any of the small research reactors which they have sold to various countries. On the other hand, as the committee is aware, the Soviets have in recent years supported us very effectively in Vienna in the development of an Agency safeguard system.

I think the fact that they have not required safeguards on their small reactors arises from two sources: First of all, most of these sales were made some time ago when they were not cooperating in the development of safeguards; secondly, I am quite sure that they feel that these units are so small that their military potential is of no significance and that safeguards are not required for any practical purpose.

Mr. PALFREY. You are aware that even though we do have safeguards imposed in this case on the Triga reactor, even if they did choose to violate them, it would require something like 100 years to accumulate enough plutonium to produce even one crude weapon, so we are not dealing here with a significant threat of diversion.

Mr. CONWAY. You can use these Triga reactors for military purposes, also, in getting data for designing a weapon for military purposes.

Mr. PALFREY. I suppose any research reactor is an instrument of research.

Mr. CONWAY. But in this particular one, your safeguards will require that it be used solely and exclusively for peaceful purposes and for no military purposes whatsoever.

Mr. PALFREY. That is right.

Senator GORE. What will be the cost, if any, to the United States of this agreement?

Mr. KRATZER. There will be no cost to the United States, Senator. The reactor was transferred under the previous agreement and there was a grant associated with that which has been paid. There is no further cost to the United States and, in fact, there is a small amount of revenue which accrues to us from the lease of fuel.

Senator GORE. What was the cost of the reactor?

Mr. KRATZER. Our cost?

Senator GORE. The amount of the grant.

U.S. GRANTS TO INDONESIA

Mr. KRATZER. Our grant was for $350,000. That was less than half of the full cost of the reactor project. I don't know what the full total cost was, but our grant must be less than half of the total.

Mr. PALFREY. We also had a $50,000 grant.

Mr. KRATZER. There was a grant of some associated research and equipment for $55,000 in 1960.

Senator GORE. Mr. Palfrey, you state this reactor is of such size that its operation for 100 years would be necessary to accumulate enough plutonium for a crude weapon. What is the exact size of the reactor?

Mr. PALFREY. It is 250-kilowatt thermal. That is the size.

Senator GORE. Is it to be associated with the university?

Mr. PALFREY. It is with the University of Technology at Bandung.

Senator GORE. The committee has received an indication, I won't call it information, that Indonesia may be planning the construction of a much larger power reactor in the reasonably near future. What information does the Commission have with respect to this?

Mr. PALFREY. I don't think that we have any firm information on that, Senator.

Mr. CONWAY. It is in the material which the Commission prepared for the International Committee meetings here that took place in

October and November, on the peaceful uses of atomic energy. You worked out a complete list of all foreign reactors presently built and planned.

Mr. PALFREY. These were reports, though, weren't they?

Mr. CONWAY. This is material you supplied the committee which reflects that in Jakarta they are planning for the 1970's a 180-megawatt electrical plant. That is in the backup material where you listed reactors.

Mr. PALFREY. These are energy forecasts, in other words.

Mr. KRATZER. I would only say, sir, that there are many reactors which are proposed. I think it would be going quite far to say that this one is planned.

Mr. CONWAY. These are your words I am using, "planned," and in your report you put "planned" and we reported it in our book using your words.[1]

Mr. KRATZER. I would like to see what we have on it. There are many of these projects, and I have no personal recollection of this one at all. My guess, knowing the status of things, is that it is just a mere idea in someone's mind. (See app. 3, p. 175.)

SWISS AGREEMENT

Senator GORE. With all of the hydroelectric potential in Switzerland, I find it interesting that they contemplate a nuclear power reactor.

Mr. PALFREY. Apparently there is a good deal more than one. It is a question of forecasting the commitments of their hydroelectrics which they can do with a moderate amount of accuracy, and looking ahead to the 1970 period it is my understanding that they feel this is logical as a supplement.

Mr. KRATZER. If I may supplement that, sir, I think the situation in Switzerland is quite interesting. I have talked to several of the Swiss people on this subject, and my understanding of the situation is that while there are some hydroelectric sites left, there is a growing public resistance to their utilization for hydroelectric power.

In other words, there is resistance to the construction of dams which would mar the beauty of the valleys and take land out of use, and so forth.

By the same token, there is considerable public resistance in Switzerland to the building of conventional thermal power stations because of the air pollution aspects of them.

Senator GORE. Senator Hickenlooper, do you have a question?

Senator HICKENLOOPER. I have no questions. I will pass at this point.

Senator BENNETT. Is there any public reaction in Switzerland against atomic electric plants?

Mr. KRATZER. I am afraid my information on that is not necessarily complete, sir. I don't know of any. But I am not sure that I have all of the information on that. I would be glad to supply any information that we can acquire for the record. (See app. 3, p. 175.)

Senator BENNETT. It is a rather logical question since there is apparently negative public opinion with respect to the other programs.

[1] See Joint Committee print, "International Agreements for Cooperation," 89th Cong., 1st sess. (1965), p. 97.

That is the only question I have, Mr. Chairman.

Representative HOSMER. Is the Sierra Club in on this Swiss opposition to hydroelectric dams? [Laughter.]

Mr. KRATZER. No, sir.

Representative HOSMER. That is one they left out, I guess.

Senator GORE. Mr. Anderson, do you have any questions?

Representative ANDERSON. No.

Senator GORE. Are there any further questions?

Senator HICKENLOOPER. At this time, I don't think so.

SAFEGUARDS UNDER SPANISH URANIUM SALES

Senator GORE. Mr. Pollack, there is an interesting problem on nondissemination, if not nonproliferation, involved here. I refer to the amount of natural uranium ores which Spain possesses. Now, as a consequence of this agreement, will Spain, which I understand is now offering her uranium on the free market, submit to any safeguards or any requirement with respect to the dissemination of her uranium?

Mr. POLLACK. Not as a consequence of this agreement, sir. That is not involved here.

Mr. PALFREY. It is important to note that the uranium which it is going to be supplying will be uranium which it possesses which is here used in a reactor which will be under safeguards. To that extent it is channeling the uranium of Spain in a safeguarded direction.

Mr. CONWAY. That is only a part of it. The point is the Canadians here, within the last year or two, according to articles in the paper, were approached by the French to supply material for the French program, but the Canadians would not do so unless safeguards went with it, in which case the sale did not go through.

Now, as to these nations like Spain that are asking our assistance and are getting assistance from the United States, have we asked them when they sell their natural uranium on the open market whether or not they would require safeguards to go with it, as the Canadians did, or are they going to be able to sell it to whoever wishes to buy it for weapon purposes or otherwise?

Mr. PALFREY. This is a question of the discussions going on between some of the suppliers of uranium. I think perhaps we might want to talk about some of those negotiations.

Mr. KRATZER. Yes, sir. We do have quite an active program of seeking to get all suppliers of natural uranium to make their sales only under safeguards. We have had discussions with Spain on this as well as many other countries.

Mr. CONWAY. You are in no better position to bring forth that policy than when you are negotiating one of these agreements for cooperation. If you can't get it then, how can you get it later, after you have agreed to help these nations? This is the best time for bringing leverage on them if this is our announced policy and we are trying to further that policy.

Mr. KRATZER. Well, we have had quite a bit of success with most of the countries we deal with in bringing these sales under safeguards. I think your point that there is some leverage at the time of these agreements is well taken, but we have not tied the two things that closely together.

Mr. CONWAY. The question would be, Have the Spanish come along on that policy? Have the Spanish agreed that they will not sell any natural uranium in the open market unless International Agency safeguards travel with them?

Mr. KRATZER. They have not agreed to such a policy, but they haven't disagreed.

Mr. CONWAY. Shouldn't the United States then find out what their policy is going to be before we then commit the United States to helping them in this regard?

Mr. PALFREY. I think this is inevitable, and you put your finger on a very basic question, Mr. Conway. I think the problem we face is if we overworked our leverage, at that point they would say, "I will proceed elsewhere and get my reactors from somewhere else."

I think part of the problem is that you are trying to persuade the Spanish Government that their atomic power future is well served if they buy U.S.-supplied reactors. I think this requires an estimate of what you can and you cannot accomplish by adding extra conditions.

Mr. CONWAY. But technically our reactors are far more advanced than the others—even the British have come around and are agreeing to use enriched uranium reactors, and are asking our assistance there. So from whom would the Spanish buy a reactor if they want a good power reactor?

Mr. PALFREY. Well, you are evaluating the French reactors against the U.S. reactors, I assume.

Mr. CONWAY. Yes, French and British both.

Mr. PALFREY. Well, the fact is that the Spanish do have under consideration a cooperative reactor program with the French, so obviously they are sufficiently attracted to them to be seriously considering it.

Mr. CONWAY. This does not prevent them from doing it anyway, so they may still do that if they want to get into the weapons program or for other reasons.

The point is, if we really believe and we are announcing a policy that we are trying to get International Agency safeguards to run with material and equipment, when we enter into arrangements with these foreign countries where they are seeking our assistance, shouldn't we try to get them to come around to our policy at that time?

Mr. PALFREY. This is a basic question of how far you can go without it backfiring?

Mr. CONWAY. Have you then brought that question up? As I gather, the Spanish have not said one way or the other.

Mr. KRATZER. That is correct. We haven't tied these two things closely together.

Mr. CONWAY. The question is, Should you not tie them together if this is a major policy of the U.S. Government? The President has announced it and we have made statements to that effect, and yet in your negotiations you are not tying them together.

Mr. POLLACK. I might say that there are a wide range of relationships between the Spanish and the United States. I would be inclined to think that probably this question is best considered in the total range of relationships rather than pegged exclusively to a single agreement for cooperation in the civil field. Certainly there is no difference of opinion here as to the end we wish to achieve.

Mr. CONWAY. There is no difference of opinion, but there may be some question of how effective you are following through on that policy, and how effectively you are willing to forward that policy.

Senator HICKENLOOPER. Are there any other questions at this time?

Representative HOSMER. I have a question about another matter.

I just made a note about this Spanish situation, that compared to other countries as to IAEA inspection, "Uranium in Spain stays mainly on a plain." Is that right? [Laughter.]

AMENDMENT TO AGREEMENT WITH PHILIPPINES

I wanted to ask you about this: We are going to need an amendment in the Philippine bilateral. They want to refuel their training reactor with some more enriched fuel. Now, is the amending coming along to the point where the AEC and the Philippine Government will get it massaged and up here in time so that there won't be any delays?

Mr. KRATZER. We think so, sir. The amendment has been presented to them. It is quite a routine type of thing, and as soon as we hear from them it can be up here very promptly.

Mr. PALFREY. You were there, as I was, Mr. Hosmer, and I think that the impetus to go through from their end is pretty good.

Representative HOSMER. When I talked with them about it they apparently had forgotten that they would have to amend the bilateral, and I suggested that they get moving pretty fast on it because their time scale indicated that they should.

Mr. PALFREY. Their memory is short, then, because I think that I suggested the same thing.

Representative HOSMER. That is all, Mr. Chairman.

Senator HICKENLOOPER. Are there any other questions?

U.S. EQUIPMENT GRANTS TO IAEA

Representative ANDERSON. I have just two quick questions. Mr. Palfrey, could you tell us anything about the program that the AEC has followed of making equipment grants? I don't know how many years that program has been going on, but what do you foresee in the future? Is it coming to an end, or is it going to continue, and if so, on what scale?

Mr. KRATZER. We have had two programs of this type, sir. Originally, we did make equipment grants with money that was appropriated to the AID, which was transferred to the Commission for equipment grants on a bilateral basis.

As I recall, this program expired around 1960 or 1961. Since that time we have had no program of bilaterals for equipment grants. We have made money available in 3 or 4 years since that time to the International Atomic Energy Agency for the awarding by them of equipment grants to various members of the Agency. This is derived from the funds that are appropriated by the Congress for the so-called voluntary contribution budget of the International Atomic Energy Agency.

Representative ANDERSON. Are you talking about special materials, the donation of special materials on that program?

Mr. KRATZER. I am talking about equipment grants themselves, or hardware, and not materials.

Representative ANDERSON. You might comment on the other when you finish with this program.

Mr. KRATZER. The equipment grants are awarded by the International Atomic Energy Agency to various member states in kind. In other words, we do not transfer the funds to them, but the actual equipment, so that it is U.S. equipment and so identified when it reaches the various countries to which it is awarded. But the grants are made by the Agency and not by us bilaterally.

U.S. GRANTS OF SPECIAL NUCLEAR MATERIAL

Now, in addition to that, we have, I think, probably every year since the Agency has come into being, offered to extend to them or grant to them $50,000 worth of special nuclear material on a cost-free basis. This is authorized by section 54 of the act, and we have taken advantage of that authorization, in the annual statement that we make at the General Conference of the International Atomic Energy Agency.

Of course, in the early days of the Agency, most of those awards were not utilized since there were no Agency projects to which they could be extended. But I imagine in the last 3 or 4 years, perhaps four or five Agency reactor projects have received material as part of the $50,000 free material offered annually by the United States, in almost every case as fuel for research reactors.

Representative ANDERSON. These come out of the budget not of the Atomic Energy Commission, but of AID?

Mr. KRATZER. In this case, the special nuclear material is out of the budget of the Commission. In other words, it is material that has been produced by the Commission with its funds and for which no revenue is received.

Representative ANDERSON. You expect to continue this?

Mr. KRATZER. Well, this is looked at every year, and I can't say what we will do in the future, but it has been our feeling that this helps the Agency get a foothold in some of these countries by having research reactor projects to which they have made a grant. It gives them full access not only through the safeguards but to the operating aspects of the reactor.

They are a partner, in other words, by virtue of these arrangements in the technical operations of the projects. They become Agency projects by virtue of the grants.

Senator GORE. Are there any other questions?

COMMUNICATION OF CLASSIFIED INFORMATION TO SWISS

Senator HICKENLOOPER. I have one or two questions now.

I have been looking at the copy of the agreement with the Swiss, with special reference to paragraph B of article III, the last paragraph in the article. It says:

> Agreed classification, patent and security policies and practices shall continue to be maintained with respect to all classified information (including any inventions or discoveries employing such information), materials, equipment, and devices which have been exchanged under the superseded agreement.

May I ask you, Mr. Palfrey, what kind of classified information has been exchanged with the Swiss?

Mr. PALFREY. My understanding is that at the time of the earlier agreement reactor technology was undergoing a process of gradually increasing declassification, and some of the particular items were at that point still classified.

Now, in case some still remains in that category, it was necessary to provide for it.

Senator HICKENLOOPER. It is my understanding that practically all information on strictly peaceful uses of atomic energy has been declassified; is that correct?

Mr. PALFREY. There may have been at an earlier stage some information that related both to production reactors and to a power reactor, and, therefore, there might be some ambiguities as to its continuing classification.

Mr. CONWAY. Could we, under the old agreement, transfer data for a production reactor under a civilian agreement for cooperation?

Mr. PALFREY. I assume we would be transferring information relating to a power reactor, but it might have some relevance to a production reactor, I suppose. That is my understanding of it.

Mr. KRATZER. I think that the situation is that under the previous agreement, information which was primarily of military significance was not transferrable, but there was, of course, a time period when much of the information on reactors was being derived from, for example, the Hanford and Savannah River production reactors and was incorporated in reports which dealt with the civilian reactors but had this particular origin.

It is in that area where there is a problem of continuing classification. The Swiss have a few reports left which on the basis of our current reading seem to be perhaps still classified, because of this question of the origin of the information but we will certainly take a very close look at these.

Senator HICKENLOOPER. That is the classified information which they may have received in the past, which may have been declassified since. Of course, I assume that once you get it to them it is declassified, in fact. Security is not very reliable on those things, so I think, in fact, it is probably declassified the minute you give it to them, subject to dissemination through various channels.

Mr. KRATZER. Security surveys are made, Senator, of the countries with whom we have had these classified agreements. Their security practices have to meet certain standards which are set forth in the annexes to the agreements.

Senator HICKENLOOPER. But I am still confused and a little in the dark about this exchange of classified information, because it has been my understanding that we did not exchange classified information with the exception of perhaps some programs under special agreement with the British or something of that kind.

CIVIL AGREEMENTS UNDER WHICH CLASSIFIED INFORMATION IS EXCHANGED

Mr. KRATZER. No, sir; there were agreements negotiated in the comparatively early days of our program in the civilian uses of atomic energy with several countries for the exchange of classified information. I am not sure if I can remember all of them, but Switzerland was one, the Netherlands was one, Canada was one, and Australia was one, in addition to Great Britain.

Senator HICKENLOOPER. What about the nature of that classified information that was exchanged? Was it information that would be materially helpful in the construction of weapons?

Mr. KRATZER. No; there was no weapons information involved at any time. It was information in defined categories, related to the peaceful uses of atomic energy. But the reasons for its classification, I think, were twofold: First of all as Commissioner Palfrey said, we have undergone this gradual process of declassification. When this program started in 1955, and that is when the original Swiss agreement was negotiated, much of the information in civil uses was classified.

It has become gradually declassified, and it is completely correct that as of this time no new information being generated in the civilian field is classified. For that reason, no additional classified information will be transmitted to Switzerland and, in fact, none has been for a number of years. This was very old information.

Senator HICKENLOOPER. This refers to information that had been previously classified, and given to them in the civilian uses field?

Mr. KRATZER. On civilian uses, but developed at a time when that information was classified, largely because of its derivation.

Senator HICKENLOOPER. Do I understand that for all practical purposes, or to all practical ends, the information that was classified information at the time it was given has now been declassified? Is that correct?

Mr. KRATZER. I think, sir, that the situation is that the substance of it has been declassified, but perhaps, as I say, the origin of it, the fact that it might have come from and been related to one of our production reactor programs, causes it to be classified. It is still a classified association.

ENRICHMENT OF MATERIAL TO BE SUPPLIED TO SPAIN

Senator BENNETT. Apparently there are a couple of questions with relation to the Spanish agreement on which we should have an answer for the record. Is it your understanding that the Spanish agreement removed the upper limit on the enrichment of the uranium that could be supplied under the agreement?

Mr. KRATZER. That is correct, sir.

Senator BENNETT. Why should it be removed?

Mr. KRATZER. We have already been supplying to Spain under the existing agreement, and have had the ability to supply to them, 90 percent enriched material. Now, the standard enrichment, which is now made available both to domestic and foreign users, is 93 percent, and there is no difference in the military significance of these two materials. The ability to use one standard enrichment in the fabrication operations and that sort of thing results in savings both to the user and the fabricator of the material.

Senator BENNETT. Then, the effective difference is only to raise the enrichment limit from 90 to 93 percent?

Mr. KRATZER. That is correct.

NO COMMITMENT BY SPAIN TO BUY U.S. MATERIALS

Senator BENNETT. The agreement with Spain involves an agreement on our part to sell to Spain. Does it also involve an agreement on the part of Spain to buy all of their requirements from us?

Mr. KRATZER. No, sir; this is handled by specific contracts on a project-by-project basis. At the time that they decide on a given project, then they contract for the U^{235} requirements of that project with us. If they do not do so within the time schedule set forth in the annex to the agreement, then we no longer have to reserve for them the amount of material corresponding to that particular project.

Senator BENNETT. If they fail to do so in one project, they are still free to come back on another project?

Mr. KRATZER. Within the time schedule applicable to that other project; yes, sir.

Senator BENNETT. Has there been any case in which they have either actually bought their material elsewhere, or indicated that they intended to do so?

Mr. KRATZER. No, sir. The three reactors, of course, covered by this project are all new projects. Two of them are quite firm, and the contract negotiations for the sale of the material to them are in fact underway. The third project is not firm. I am sure, however, if it is firmed up, that the material will be bought from us.

Senator BENNETT. Thank you.

TARAPUR PROJECT

Mr. CONWAY. As a followup on that, Senator, the Indian agreement on Tarapur, as I recall, did require that they purchase from the United States a certain amount of their equipment. Do we have a different policy with the different countries?

Mr. TROSTEN. You mean of the material, Mr. Conway?

Mr. CONWAY. Yes.

Mr. KRATZER. No, the Indian agreement is unique in that respect, and that provision was actually included in the Indian agreement at their own request. I can explain the reasons why, if you would like me to do so.

Senator HICKENLOOPER. I would like to hear it.

Mr. KRATZER. Well, the Indians have long held a belief that safeguards should be attached only to the sale of materials and not to the sale of equipment. Now, in the agreement which we have with India concerning the Tarapur reactor, we insisted that the safeguards would apply to the Tarapur reactor regardless of whether it was fueled with our material or whether it was fueled with any other material, which is our standard policy.

Now, they accepted that, but in order to make their acceptance consistent with their own beliefs, they put in the agreement, as I said, at their own initiative, that the Tarapur reactor always would be fueled with U.S. material.

IAEA SAFEGUARDS

Senator HICKENLOOPER. Mr. Chairman, may I ask, with respect to the International Atomic Energy Agency safeguards policy, how do they compare with our standards of safety as U.S. standards of safety within our own operation?

Mr. KRATZER. We are talking about safeguards to determine peaceful uses of material?

Senator HICKENLOOPER. That is right. Well, it is the disposition and all of that, disposition of residues and reclamation of products and so on.

Mr. KRATZER. Well, I think that, then, we may not be talking about safeguards in the control sense, but safeguards in the safety standards sense; is that correct, sir?

Senator HICKENLOOPER. Take the whole ball of wax of the safety provisions of the International Agency and the safety provisions which we apply and put them side by side. Are their safeguard provisions, on the whole, at least as cautious and secure as ours are in this country?

Mr. KRATZER. Yes, sir; we feel that they are. We, of course, participate very actively in the development of the Agency safeguards system. We have U.S. people from our own safeguards staff in the safeguards staff of the Agency in Vienna. It is our effort to make these two comparable, and we feel that they are. And I might say that the people who are subject to their inspection feel that they are, too.

Senator HICKENLOOPER. Thank you.

SPANISH DON PROJECT

Representative HOSMER. I would like to get back to this Spanish thing again. You are going to cooperate with the Spanish on their DON reactor, is that right?

Mr. KRATZER. That is under consideration, Mr. Hosmer. We have talked to them about it. Subject to, first of all, their firming up the DON project, in other words, getting governmental approval for it, and subject to our being able to agree on the terms of a cooperative arrangement, I think that the Commission would favor such a thing, and would want to propose it for authorization to the Congress.

Representative HOSMER. You have already offered them 366 kilograms of enriched uranium for their fuel loading. That is on a waiver-of-fuel-charge basis?

Mr. KRATZER. No, sir, we can't make such an offer without authorization. We have talked to them about it, as part of a cooperative program that would be subject to authorization.

Representative HOSMER. Isn't there some question or not whether this reactor is so small that very little usable information will be forthcoming from it?

Mr. KRATZER. Well, I think probably the reactor people could respond to that more effectively than I could. I know that there are features of this reactor that are of interest to us. I believe they relate to the pressure tubes, and so on.

Representative HOSMER. I think Mr. Ink had something on his mind.

Mr. INK. Mr. Hosmer, again the reactor people could go into more detail with you, but we do feel that this would be of use to us, particularly in the event that we do go forward with our own heavy water prototype in a year or two.

First of all, there has been conceptual design work completed, roughly $2 million worth, so that we have a pretty good idea of what the project would look like. Both they and we, in our forward planning for our prototype, plan to use uranium carbide fuel rod bundles. We both are planning to use the same general type of

aluminum material for our pressure tubes. The temperature would be, very roughly, halfway between what we have at Piqua, and what we contemplate for our prototype.

So these are some of the reasons why we think it would be useful to us.

Representative HOSMER. Now, what I am trying to get at here is related to the HWOCR that you people keep coming up here with every year and wanting money for, and which is going to be a vast monster and consume more gold than it consumes uranium before it is through. I am wondering if there is something you can't do with the Spanish to beef up their effort, to give them some more help, to get this thing off our back?

Mr. INK. You might want to talk to Commissioner Ramey, but I don't see any likelihood of their being in a position to go forward with the size or magnitude of program as their next step that would provide a substitute for the kind of prototype we are talking about.

As you know, this DON project is 30 megawatts electrical, and what we are contemplating would be in the neighborhood of 300 megawatts electrical.

Representative HOSMER. I am well aware of that. You have a letter dated January 20 from the committee asking you specifically if there wasn't something you could do with the Spanish to support this domestic project. I hope that you will give it good consideration and try to come up with something reasonable.

Mr. INK. Yes, sir.

(Correspondence concerning this subject is set forth in app. 4, p. 176.)

BRAZILIAN AGREEMENT

Representative HOSMER. I did have another question, which is a general one.

You remember last year you were up here and we kicked this Brazil Agreement around for a long time. There were questions as to why it had been delayed so long, and the answer was that somebody down in Brazil had to get it before their Congress and a few other things. We haven't heard anything since. We gave it an OK here under the act, but I understand that the agreement is still dangling; is that correct?

Mr. KRATZER. This agreement has been approved by the concerned committees of the Brazilian Parliament, but it has not been ratified by the whole Parliament. I believe that the Brazilian Parliament resumes in March, and we are exerting every effort to make certain that they promptly take up this subject.

Representative HOSMER. The reason I bring it up is because the committee is left in the dark. We go through these hearings and everything is OK on our side, but we never read the end of the story.

Mr. PALFREY. We recognize that, Mr. Congressman.

GREEK AND IRANIAN AGREEMENTS

Representative HOSMER. I think we had to ask you about the Greek and Iranian Agreements, too, which are apparently in a dangling state; is that correct?

Mr. KRATZER. Yes, that is correct.

(The correspondence referred to follows:)

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., December 13, 1965.

Mr. R. E. HOLLINGSWORTH,
General Manager, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. HOLLINGSWORTH: The attached document purports to list, among other things, the bilateral agreements for cooperation concerning the civil uses of atomic energy in force as of September 1965. In connection with one country included in the list, Indonesia, there is a footnote which states "Amendment approved and provisionally in force."

As you know, the agreement for cooperation with Indonesia which expired on September 20, 1965, was the subject of executive session discussions between the Joint Committee, the AEC, and the State Department on July 19 and August 24, 1965. Subsequently, under letter dated October 28, 1965, the Department of State transmitted to the Joint Committee copies of the exchange of notes, the text of which the State Department has requested to be held confidential, wherein the Government of Indonesia recognized the continuing effect of the safeguards and guarantees provisions of the expired agreement for cooperation of June 8, 1960. To this date no new agreement for cooperation with Indonesia nor any amendment to extend the effective period of the original agreement with Indonesia has been submitted to the Joint Committee, as required by law. As a matter of fact, the above-mentioned letter from the Department of State informed the committee that "the proposed extension of the [Indonesian] agreement is now awaiting Presidential decision." Thus, I gather, no such amendment has ever been approved by the President, much less submitted to Congress for the requisite period and "provisionally in force." The footnote appended to the enclosed document with reference to the Indonesian Agreement is, therefore, erroneous.

The same footnote appears in connection with the Iranian and Greek Agreements for cooperation. Upon examining the current status of these bilaterals, I find that more than a year after the amendments thereto were signed, approved by the President and submitted to the Joint Committee for the required period of time, they apparently have not entered into force definitively, presumably because of inaction by the appropriate governmental authorities of Greece and Iran.

The Iranian bilateral in particular appears to have had a troubled history. The original agreement was signed on March 5, 1957, but, according to information published by the Department of State, did not enter into force until April 27, 1959—more than 2 years after its signing. Moreover, it was not until some time after the 5-year term of this agreement had expired in April 1964 before a proposed amendment extending the agreement's effective period was either signed, approved by the President, or submitted to the Joint Committee. Now, more than 19 months after expiration of the term of the original agreement, and nearly a year and a half after submission to the Joint Committee of a proposed renewal agreement, that agreement has not entered into force definitively.

With respect to the Iranian bilateral I have the following questions:

1. Has the United States furnished any special nuclear material to the Government of Iran?
2. If so, on what date or dates were shipments of these materials made?
3. What is the reason for the Iranian Government's delay in bringing the amendment to its agreement for cooperation into force definitively?
4. What is the status of the nuclear reactor which our records show an American company, acting under the authority contained in the original agreement for cooperation, delivered to Iran more than 3 years ago?

I would also like to have an explanation for the apparent inaction on the part of the Greek Government in bringing the amendment to its agreement into force definitively. In addition, I would appreciate learning whether any Commission shipments of special nuclear material have been made to Greece during the period that this amendment has been "provisionally in force," and what other activities, if any, have been carried on under the agreement during this time.

Your answers to the foregoing questions will be appreciated.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

AGREEMENTS FOR COOPERATION

Bilateral agreements for cooperation in the civil uses of atomic energy, September 1965

The following agreements are now in effect:

Number of latest amendment	Country	Scope	Effective date	Termination date
1	Argentina	Research	June 27, 1962	July 27, 1969
1	Australia [1]	Research and power	May 28, 1957	Mar. 27, 1967
1	Austria	Research	Jan. 25, 1960	Jan. 24, 1970
0	Brazil [2]	do	Aug. 3, 1955	Aug. 3, 1965
3	Canada [1]	Research and power	July 21, 1955	July 13, 1980
4	China, Republic of	Research	July 18, 1955	July 17, 1974
0	Colombia [3]	do	Mar. 29, 1963	Mar. 28, 1967
0	Costa Rica	do	Feb. 8, 1961	Feb. 7, 1966
2	Denmark	do	July 25, 1955	Sept. 7, 1968
5	France	Research and power	Nov. 20, 1956	Nov. 19, 1966
	Germany:			
2	Federal Republic	do	Aug. 7, 1957	Aug. 6, 1967
1	City of West Berlin	Research	Aug. 1, 1957	July 31, 1967
4	Greece [4]	do	Aug. 4, 1955	Aug. 3, 1974
0	India	Research and power	Oct. 25, 1963	Oct. 24, 1993
0	Indonesia [4]	Research	Sept. 21, 1960	Sept. 20, 1965
1	Iran [4]	do	Apr. 27, 1959	Apr. 26, 1964
2	Ireland	do	July 9, 1958	July 8, 1968
5	Israel	do	July 12, 1955	Apr. 11, 1975
1	Italy	Research and power	Apr. 15, 1958	Apr. 14, 1978
2	Japan [3]	do	Dec. 5, 1958	Dec. 4, 1968
2	Korea, Republic of	Research	Feb. 3, 1956	Feb. 2, 1976
2	Netherlands [1]	Research and power	Aug. 8, 1957	Aug. 7, 1967
0	Norway	do	June 10, 1957	June 9, 1967
0	Panama	Research	June 27, 1963	June 26, 1968
2	Philippines	do	July 27, 1955	July 26, 1968
4	Portugal	do	July 21, 1955	July 20, 1969
1	South Africa	Research and power	Aug. 22, 1957	Aug. 21, 1967
0	Spain	do	Feb. 12, 1958	Feb. 11, 1968
3	Sweden	Research	Jan. 18, 1956	June 1, 1968
2	Switzerland [1]	Power	Jan. 29, 1957	Jan. 28, 1967
4	Thailand	Research	Mar. 13, 1956	Mar. 12, 1975
2	Turkey	do	June 10, 1955	June 9, 1966
4	United Kingdom	Research and power	July 21, 1955	July 20, 1966
0	Venezuela [3]	do	Feb. 9, 1960	Feb. 8, 1970
1	Vietnam	do	July 1, 1959	June 30, 1974

[1] Provides for exchange of classified information.
[2] Amendment extending agreement on Aug. 2, 1975 awaiting ratification by Brazilian Government.
[3] Previous agreement expired.
[4] Amendment approved and provisionally in force.

Agreements with multi-national organizations

Number of latest amendment	Organization	Scope	Effective date	Termination date
1	United States-European Atomic Energy Community (Euratom).	Provides for development of United States-Euratom joint nuclear power research and development programs.	Feb. 18, 1959	Dec. 31, 1985
2	United States-Euratom additional agreement.	Provides for additional areas of cooperation provided for in first agreement.	July 25, 1960	Dec. 31, 1995
0	United States-International Atomic Energy Agency (IAEA).	Provides for U.S. cooperation with the IAEA.	Aug. 7, 1959	Aug. 7, 1979
0	do	Provides for application of IAEA safeguards to 4 U.S. reactors.	Aug. 1, 1964	July 31, 1969

Trilateral agreements for the application of IAEA safeguards by IAEA to equipment, materials, and facilities subject to safeguards under U.S. bilateral agreements

	Effective date	Termination date
United States-IAEA-Japan	Nov. 1, 1963	Nov. 1, 1967
United States-IAEA-Philippines	Sept. 24, 1965	July 26, 1968
United States-IAEA-Thailand	Sept. 10, 1965	Mar. 12, 1975
United States-IAEA-South Africa	Oct. 8, 1965	Aug. 21, 1967

The following additional nations have agreed to accept IAEA safeguards over nuclear materials and equipment supplied by the United States; the dates of entry into force are to be established:

Argentina
Austria
Brazil
China
Congo (Léopoldville)
Finland
Greece
India
Iran
Israel
Mexico
Norway
Pakistan
Portugal
Sweden
Vietnam
Yugoslavia

Special arrangements

Organization	Scope	Effective date	Termination date
United States AEC-U.S.S.R. State Committee on the Utilization of Atomic Energy Memorandum for Cooperation in the Field of the Utilization of Atomic Energy for Peaceful Uses.[1]	Provides for unclassified information and personnel exchanges.	May 21, 1963	Dec. 31, 1965
United States AEC-U.S.S.R. State Committee on the Utilization of Atomic Energy Agreement for Cooperation in the Field of Desalination Including the Use of Atomic Energy.	Provides for scientific and technical cooperation including the exchange of information and personnel.	Nov. 18, 1964	Nov. 18, 1966

[1] Under the current United States-U.S.S.R. exchange agreement in scientific, technical, cultural, and other fields 1964–65.

AGREEMENTS FOR MUTUAL DEFENSE PURPOSES

Country	*Effective date*
NATO [1 2]	Mar. 13, 1965
Australia [1]	Aug. 14, 1957
Belgium [1]	Sept. 5, 1962
Canada [1]	July 27, 1959
France	July 20, 1959
France [1]	Oct. 9, 1961
Germany: Federal Republic [1]	July 27, 1959
Greece [1]	Aug. 11, 1959
Italy [1]	May 24, 1961
Netherlands [1]	July 27, 1959
Turkey [1]	Do.
United Kingdom [1] (as amended)	July 20, 1959

[1] Provides for exchange of classified information.
[2] Previous agreement superseded.

Statistical summary

	1950	1955	1960	1961	1962	1963	1964	1965
Research	------	19	27	24	22	22	22	20
Research and power	------	3	13	13	13	13	14	14
Power	------	------	1	1	1	1	1	1
Special agreements (with Euratom and IAEA)	------	------	3	3	3	3	4	3 4
Mutual defense purposes (with 10 nations and NATO)	------	------	9	12	12	12	12	12
Trilateral safeguards agreements (with IAEA)	------	------	------	------	------	1	1	[1] 4
Exchange agreements with the U.S.S.R.	------	------	1	1	1	1	2	2

[1] 17 additional agreements have been signed by parties involved; date of entry into force is to be established.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., December 23, 1965.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: The tabular list of effective Agreements for Cooperation forwarded with your letter of December 13 was a provisional list prepared for the first draft of the Commission's 1965 Annual Report to the Congress. Because it was the latest summary of agreements then available, it had been included among documents collected as background papers for the White House Conference on International Cooperation. The footnote to which you referred ("4.—Amendment approved and provisionally in force") was incorrect with respect to both Indonesia and Iran and would have been reviewed and corrected at the end of the year in connection with the final drafts of the annual report.

As your letter stated, no extension of the Agreement for Cooperation with Indonesia has been submitted to the Joint Committee. An amendment to extend the agreement for 5 years, with the application of IAEA safeguards, was initialed by the Indonesian and U.S. Governments and is at the White House for Presidential decision.

With regard to the first two of your questions on the agreement with Iran, the United States has not furnished any special nuclear materials to the Government of Iran and will not do so until the amendment is effective.

As to the delay by the Iranian Government in bringing the amendment to the bilateral into force, the ratification procedures of that Government have consistently been very time consuming. While the delay is unfortunate, the fact that no special nuclear materials have been furnished Iran makes the hiatus between the expiration of the previous agreement and the entry into force of the amendment somewhat less meaningful. Nevertheless, we have, in conjunction with the Department of State, urged the Government of Iran to complete its approval of the amendment and have repeatedly checked on the status of its action. It has been reported to us most recently that the amendment has cleared the Iranian Senate Foreign Relations Committee and that, after action by the Senate, approval will be sought from the House

A research reactor was delivered in 1961 by the American Machine & Foundry Co. for the facility being constructed near the University of Tehran. Continuing difficulty has been experienced by the Government of Iran in moving forward with the completion of this research reactor which was approved in July 1962 for a grant under the U.S. research reactor program. The reactor building, which is being constructed by a local contractor, has not been completed and the reactor components have not yet been uncrated. To assist the Government of Iran in the resolution of these difficulties, an expert from the United States was made available by the IAEA as the reactor project adviser on a long-term assignment and an appraisal of the project was made in a visit to Iran by a reactor expert from an AEC contractor. Although it has appeared on occasion that the Government of Iran would abandon the project, we have been informed recently that they intend to proceed. We have felt that it has not been in the interest of the United States to press the Government of Iran to complete this project since, in the absence of sufficient local incentive to do so, it is unlikely that the completed project would be a successful one. The AEC's grant procedures provide that payments of grants shall be made only upon completion of construction and successful operation of the reactor involved. Thus, no payment has been made to Iran under the 1962 research reactor commitment.

In the case of the amendment to the agreement with Greece, the continuing series of crises experienced by the Greek Government since early 1964 have undoubtedly contributed to the delay in ratification of the amendment. The issue of Cyprus and the mounting tension between Greece and Turkey overshadowed practically all other affairs of state in Greece throughout the summer and fall of 1964. Parliamentary difficulties then arose and reached a high point with the resignation of the Papandreou government on July 15, 1965. During the period from mid-July to mid-September 1965, Greece experienced three successive changes of government, none of which could maintain an effective mandate. The present Stephanopoulos government enjoys only a two-vote majority in Parliament and disruptive tactics by the opposition make it difficult to carry out even day-to-day business.

No special nuclear materials have been transferred to Greece under the present amendment and, in order to maintain leverage on the Greek Government to secure ratification, no transfers will be made until the amendment is ratified and

thereby definitively in force. Arrangements have proceeded for the transfer of safeguard responsibilities to the International Atomic Energy Agency. The trilateral agreement for this purpose has been signed and the joint inventory which would bring it into effect has been submitted to the IAEA for acceptance.

Arrangements have been made for the Brookhaven National Laboratory and the Democritus Center to develop a sister-laboratory relationship involving visits by BNL scientists to Democritus and exchange of published information. No other activities have taken place.

Should you have questions regarding the foregoing information, we shall be glad to answer them.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

Representative HOSMER. They came before the committee about a year and a half ago, and what happened in connection with them?

Mr. KRATZER. Well, the Iranian agreement has not been ratified. No material has been supplied to them.

Representative HOSMER. You mean by the Iranians?

Mr. KRATZER. Yes; and although they have a research project underway, at times it has seemed very doubtful whether the project would ever be successfully completed. Our latest reading is that they probably will go ahead with it, and that they intend to ratify the agreement very shortly.

The Greek situation is somewhat different. We have had continuing difficulties with obtaining timely ratification of these agreements with Greece by their Parliament. We have a procedure with the Greeks that involves their putting the agreements provisionally into force, which our counsel has concluded does meet the requirements of the act. But notwithstanding that, we do press them to get formal ratification of the agreement and we hope that we can achieve that very soon.

Representative HOSMER. I wonder if it would be too much of a difficulty for the Commission to keep us posted about twice a year on these unfinished business-type of arrangements that are dangling.

Mr. PALFREY. We certainly could.

Representative HOSMER. Mr. Chairman, I would ask that that be done. I think it would be helpful to our staff in preparation for hearings of this nature.

Senator GORE. It will be done.

(The following correspondence was subsequently received:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., February 15, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: At the hearing of the Subcommittee on Agreements for Cooperation on January 27, 1966, it was requested that the committee be informed on a regular basis of the status of agreements for cooperation which have been submitted to, and considered by, the committee but which have not become effective. I am pleased to provide the following information on all such agreements.

An amendment to the current agreement for cooperation with Austria was signed in May 1965, and presented to the Joint Committee on May 27, 1965. The amendment, which does not affect the term of the present agreement (due to expire in January 1970), would permit the United States to provide uranium enriched to more than 90 percent for research and materials testing reactors, and permit Austria to perform conversion and fabrication services. The amendment has been presented to the Austrian Parliament which has not yet acted upon it.

As was noted in Mr. Hall's response of December 23, 1965, to your letter of December 13, the amendment to the agreement with Greece is provisionally in force and we are actively seeking its ratification by that Government. The same response reported upon the position with respect to the amendment to the Iranian agreement. The status of the superseding agreement for cooperation with Brazil was reviewed in Mr. Hall's other letter of December 23, 1965, regarding our plans for the negotiation of agreements for cooperation during this year.

The amendments to the agreements with Indonesia and Spain, and the superseding agreement with Switzerland, which were considered at the subcommittee hearing on January 27, have now completed the requirements of U.S. ratification and will become effective upon the exchange of notes following ratification by the other governments.

In addition to the above-mentioned agreements there are four bilateral agreements, presented to the committee in 1957 and 1958, which have never become effective. These proposed bilaterals, power agreements with Brazil, Cuba, and Peru and a research agreement with Iraq, are no longer regarded as potential agreements. In the case of the proposed bilateral with Cuba, that country completed all of its ratification requirements in August 1959, but due to the deterioration in relations between the two countries, the United States did not provide Cuba with the note to bring the agreement into effect. The other three agreements were never ratified by the other governments due to a change of interest in proceeding with a planned nuclear program.

Please let me know if any further information on these agreements should be desired. We shall in the future keep you informed on a semiannual basis of the status of all unratified bilaterals.

Sincerely yours,

JOHN V. VINCIGUERRA,
Acting Assistant General Manager for International Activities.

ATOMIC ENERGY COMMISSION,
Washington, D.C., August 8, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: In Mr. Vinciguerra's letter of February 15, 1966, we stated that we would inform you on a semi-annual basis of the status of signed Agreements for Cooperation which are awaiting ratification by the other party.

Among the agreements reported upon in the February 15 letter, the amendment to the agreement with Spain was brought into force on April 1, 1966, as reported in my letter of May 6.

With regard to the amendment to the agreement with Greece, which is provisionally in force, we are informed that a report recommending ratification of the amendment is being submitted by the Government to the Interim-Parliamentary Committee for action and that ratification may be forthcoming within a month.

The amendment to the agreement with Iran has been approved by the appropriate committees of the Iranian Senate but floor action by the Senate was delayed by questions regarding the siting of the reactor. While the Senate may consider the agreement in an extraordinary Session, the Majlis, which must also approve the agreement, has adjourned for the summer. The U.S. Embassy is hopeful that action by both Houses of Parliament will be completed soon after Parliament resumes in October and is continuing its efforts toward this objective.

The Agreement for Cooperation with Brazil is before the Brazilian Senate. Action by the Committees on Energy, Agriculture, and Finance is required before the agreement can be taken up by the full Senate, unless the Government should seek and obtain a petition of urgency. If it does not, Senate approval prior to September seems unlikely.

Ratification by Indonesia of the amendment to the agreement with that country has been delayed by political events and the resulting Cabinet changes in the Indonesian Government. The U.S. Embassy is continuing efforts to expedite approval of the amendment by the Cabinet Presidium.

Ratification procedures of the Government of Switzerland have been completed for the superseding agreement with that Government and the exchange of notes to bring the agreement into force will take place shortly.

The amendment to the agreement with the Philippines, which the Joint Committee considered on June 28, completes its thirty-day period before the Joint Committee on August 4 and no unusual delay in the exchange of notes to bring the amendment into force is anticipated.

We shall inform you promptly of changes in the status of the foregoing agreements as they occur and send you a further semi-annual roundup next January.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

Senator GORE. Do you know if the United Kingdom has supplied the Swiss with nuclear fuel?

Mr. KRATZER. No, sir; I don't. The United Kingdom has supplied some modest amounts of enriched uranium to several European countries. My best recollection is that that does not include Switzerland.

Senator GORE. Will you inquire into this, and if so, state in the record whether or not such supplies from Great Britain would be subject to the safeguards?

Mr. KRATZER. I can assure you that all Britain's arrangements have been subject to safeguards provisions very much like our own, but I don't know whether they have supplied any to Switzerland. (See app. 3, p. 175.)

Senator GORE. There will be a few other questions, which I will furnish you in writing, to which I request that you supply answers for the record.

(The questions referred to and AEC's answers thereto follow:)

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., February 12, 1966.

Hon. JOHN G. PALFREY,
Commissioner, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. PALFREY: I have received and want to thank you for the Commission's letter of February 7, 1966, furnishing additional information on several points raised during the hearing held by the Joint Committee's Subcommittee on Agreements for Cooperation on January 27, 1966.[1]

As you will recall, Senator Gore, chairman of the subcommittee, at the conclusion of the hearing requested that the witnesses appearing on behalf of the Commission supply answers for the record to some questions which he would furnish them in writing. Senator Gore has asked that I convey the list of questions to you. These questions, which relate to the civil agreements for cooperation with Indonesia, Spain, and Switzerland considered at that hearing, are set forth below.

1. In response to a question during the hearing Mr. Kratzer said that the guarantee provisions of the Indonesian agreement (relating to the use of equipment and material supplied thereunder for peaceful purposes only) would continue for the operating life of the American reactor purchased by Indonesia, even if the agreement were to be sooner terminated and the U.S.-supplied fuel returned to this country.

The Committee would like to know specifically whether the safeguards provisions also outlive the agreement, and whether by virtue thereof the United States would have the right after termination or expiration of the agreement to conduct periodic safeguards inspections to insure that the reactor is not being used for military purposes; further whether, once arrangements have been made for the International Atomic Energy Agency to assume responsibility for applying safeguards under this agreement, the IAEA would have the right after termination or expiration of the bilateral to conduct such safeguards inspections.

2. Chairman Seaborg in his letter of January 12 noted that article VI of the new Swiss bilateral implements the provisions of the "Private ownership" legislation by providing a framework within which private persons in the two countries

[1] See app. 3, p. 175.

may be parties to transfers of special nuclear material. He also noted that the details of such transfers have not been worked out as yet. Please explain this matter more fully. What are some of the situations the Commission envisions as subject to this language?

3. Article VII of the Swiss bilateral states that prices for U^{235} sold, or for service performed by the United States, will be those in effect for domestic customers. Has the United States ever committed itself, in a bilateral, to these conditions?

4. Please explain in more detail the article IX–B guarantee by the U.S. Government (pertaining to the peaceful use of material or devices transferred to the United States by the Swiss). Is this a common provision in bilaterals?

5. Does article X–B (the safeguards article) give the U.S. the right to inspect Swiss chemical processing and fuel fabrication plants, even though they were not built with U.S. help? If so, will the IAEA have a similar right once the safeguards responsibilities under this bilateral are turned over to the IAEA?

6. Please explain the differences in language between article VIII–D of the Spanish bilateral and article VII–E of the Swiss bilateral.

7. Are you able to estimate the total quantities of U^{235} which could be transferred to Spain and Switzerland under these bilaterals if all the enriched uranium were sold, as opposed to being furnished under an enriching service arrangement?

8. Does the Commission plan to deviate from its announced policy of leasing (as opposed to loaning) enriched uranium and heavy water for research applications, other than for the DON project?

9. In your prepared statement you referred to transfers of special nuclear materials to Spain for research applications, including reactor prototypes. Is there any limit on the size of these prototypes?

One other matter relates to the Commission's February 7 letter. In that letter the AEC informed the Committee that the United Kingdom Atomic Energy Authority and the Swiss Federal Institute for Reactor Research have recently concluded an agreement under which the UKAEA will supply fuel for the Swiss NRE test reactor. As we understand it, the agreement provides for the application of United Kingdom safeguards; however, it further provides that the parties will undertake consultations with a view to negotiating an agreement providing for the assumption of these safeguards responsibilities by the IAEA.

The Joint Committee would be interested to learn the following concerning this agreement: whether it provides for termination in the event the parties are unable to agree upon the application of IAEA safeguards prior to the time when deliveries of the fuel will be made; why the agreement did not specifically provide that the Agency would be requested to assume the safeguards responsibilities; which party, if either, opposed a provision calling for assumption of the safeguards responsibilities by the IAEA; and whether you know of or foresee any insurmountable problems to eventual agreement by the parties for the transfer of these responsibilities to the IAEA.

Any information you can furnish concerning these latter questions, together with your answers to the questions listed above, will be appreciated.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

ATOMIC ENERGY COMMISSION,
Washington, D.C., March 10, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: I am pleased to provide the enclosed replies to the additional questions regarding the agreements for cooperation with Indonesia, Spain and Switzerland, as requested in your letter of February 12.

In addition to the numbered questions, your letter also requested further information on the safeguard aspects of the civil uses agreement between the United Kingdom and Switzerland. That agreement contains no provision for its termination in the event the parties are unable to agree upon the application of IAEA safeguards prior to the time of delivery of fuel for the N.R.E. test reactor. The agreement specifically states that materials will be supplied under bilateral safeguards until such time as IAEA controls are in effect. The precise wording of the agreement with respect to the transfer of safeguards to the IAEA is "* * * the Contracting Parties will enter into consultations with the IAEA at a time to be agreed, with a view to negotiating an agreement under which the controls and safeguards provided by this Agreement would be administered by the Agency."

Because we have no direct source of information regarding the considerations which went into the negotiation of this agreement, we are unable to state why the agreement did not specifically provide that the Agency would be requested to assume the safeguard responsibilities, or whether either of the parties might have been opposed if indeed such a provision had been suggested during the negotiations. We do not, however, think that there is any problem of intent insofar as the parties are concerned. The U.K. has already transferred to the IAEA its safeguard responsibilities under its agreements with both Denmark and Japan, while Switzerland has, in its agreement with us, accepted the principle of applying IAEA safeguards to its bilateral activities. We do not, therefore, see any insurmountable problems to agreement between the U.K. and Switzerland for the transfer to the IAEA of safeguard responsibilities under their bilateral.

I hope the information supplied herewith satisfactorily responds to the questions asked. Should further information be desired on any of the points covered, please let us know.

Sincerely,

JOHN G. PALFREY, *Commissioner.*

Enclosure: Replies to Questions Regarding Agreements for Cooperation.

REPLIES TO QUESTIONS REGARDING AGREEMENTS FOR COOPERATION

1. *Question.* In response to a question during the hearing Mr. Kratzer said that the guarantee provisions of the Indonesian agreement (relating to the use of equipment and material supplied thereunder for peaceful purposes only) would continue for the operating life of the American reactor purchased by Indonesia, even if the agreement were to be sooner terminated and the U.S.-supplied fuel returned to this country.

The Committee would like to know specifically whether the safeguards provisions also outlive the agreement, and whether by virtue thereof the United States would have the right after termination or expiration of the agreement to conduct periodic safeguards inspections to insure that the reactor is not being used for military purposes; further whether, once arrangements have been made for the International Atomic Energy Agency to assume responsibility for applying safeguards under this agreement, the IAEA would have the right after termination or expiration of the bilateral to conduct such safeguard inspections.

Answer. As Mr. Kratzer indicated during the hearing, the U.S. has consistently held that both the safeguard rights and the peaceful uses guarantee provided in the Indonesian agreement, and in our other agreements for cooperation, continue beyond the term of the agreement and apply for the life of the reactor. The right to conduct periodic inspections would, therefore, continue as a part of these safeguard rights. Additionally, the U.S. would have the right, subsequent to the expiration of the agreement, to apply safeguards to material produced in the reactor.

With respect to the assumption of safeguards by the IAEA, it has been the practice to have the term of the trilateral agreement providing for Agency safeguards expire at the same time as, or just prior to, the expiration of the bilateral agreement for cooperation. Unless, therefore, the parties to the trilateral agreement should decide to continue the effectiveness of that agreement for an additional period, the safeguard rights of the U.S. under the bilateral would automatically be restored upon the expiration of the trilateral safeguards agreement and the question of the continuation of Agency safeguards inspection rights over the reactor would not arise.

2. *Question.* Chairman Seaborg in his letter of January 12 noted that Article VI of the new Swiss bilateral implements the provisions of the "Private Ownership" legislation by providing a framework within which private persons in the two countries may be parties to transfers of special nuclear material. He also noted that the details of such transfers have not been worked out as yet. Please explain this matter more fully. What are some of the situations the Commission envisions as subject to this language?

Answer. The statement in Chairman Seaborg's letter of January 12, in connection with Article VI of the Swiss bilateral creating authority for private transactions involving special nuclear material, was made in light of the fact that we are now in the early stages of implementing the provisions of the Private Ownership Act relevant to private exports of special nuclear material. Amendments to the AEC's existing regulations governing the licensing of special nuclear material and establishing the requirements for export were published in the Federal Register for comment in September 1965 and we expect the revised regulations to be promulgated shortly.

In addition to our domestic requirements, we will need to explore with our bilateral partners the specific actions they plan to take, if any, in establishing a framework internally for private parties to import and export special nuclear material. Our objective will be to assure ourselves regarding the eligibility of a project involving private parties in the two countries and the application of the same terms and conditions with respect to the possession and use of special nuclear material as have prevailed with respect to government-to-government arrangements.

Therefore, we expect in the coming months to develop more specifically the framework for special nuclear material transactions involving private parties.

Under the new language of Article VI we can anticipate that a private U.S. firm could contract directly with a private foreign firm to provide, for example, enriched uranium fuel for a power reactor from its own inventory of special nuclear material. Other private transactions under Article VI could also include the privately negotiated export of equipment and devices utilizing special nuclear material such as fission counters, neutron sources, and calibration instruments.

3. *Question.* Article VII of the Swiss bilateral states that prices for U–235 sold, or for service performed by the U.S., will be those in effect for domestic customers. Has the U.S. ever committed itself, in a bilateral, to these conditions?

Answer. Under Article VII D., the United States has agreed to sell U–235 and provide enrichment services at prices in effect for users in the United States. This language has not been included in bilateral agreements previously. However, such price comparability has been the consistent policy of the Commission and has been publicly stated on several occasions. It is, of course, an important consideration in assuring overseas purchasers that they will not be subjected to arbitrary price adjustments if they purchase U.S.-built reactors requiring enriched fuel. Accordingly, it was considered appropriate to respond affirmatively to the request of the Swiss for the inclusion of the provision in the agreement.

4. *Question.* Please explain in more detail the Article IX–B guarantee by the U.S. Government (pertaining to the peaceful use of material or devices transferred to the U.S. by the Swiss). Is this a common provision in bilaterals?

Answer. The United States' guarantee respecting produced material in Article IX–B of the superseding agreement with Switzerland was requested by the Swiss and reflects the following Presidential policy statement on November 18, 1956, in connection with the announced availability of U–235 for foreign distribution: "One of the steps I have approved is an offer to purchase at specific prices plutonium and uranium 233 produced in reactors abroad which are fueled with materials furnished under our agreements for cooperation. The materials so acquired by the United States will be used solely for peaceful purposes." This policy also provided that in any case in which the repurchased material is intermingled with other material and cannot, during its reprocessing, be kept separate from material produced in the United States, an equal amount of U.S. material will be reserved for peaceful purposes. Similar commitments regarding the peaceful uses of produced material acquired by the U.S. are contained in the agreement with India covering the Tarapur Power Station and in the agreement for cooperation with Japan.

The guarantee with respect to the peaceful use of equipment and devices transferred to the Government of the United States is the same as that contained in the 1956 agreement with Switzerland.

5. *Question.* Does Article X–B (the safeguards article) give the U.S. the right to inspect Swiss chemical processing and fuel fabrication plants, even though they were not built with U.S. help? If so, will the IAEA have a similar right once the safeguards responsibilities under this bilateral are turned over to the IAEA?

Answer. Under Article X–B of the Swiss agreement, the U.S. would have the right to inspect Swiss chemical processing and fuel fabrication plants which were not built with U.S. help whenever such plants contain special nuclear materials which are subject to U.S. safeguards. Such inspection rights would not apply during periods when the plants did not contain such U.S. safeguarded material. When safeguard responsibilities are assumed by the IAEA, the Agency will have the same right to inspect plants containing material subject to safeguards. Of course, should the Swiss choose to avail themselves of the substitution principle, the substituted material rather than the plant would be inspected.

6. *Question.* Please explain the differences in language between Article VIII–D of the Spanish bilateral and Article VII–E of the Swiss bilateral.

Answer. Adoption of "toll enrichment", and concomitant methods of calculating production accounts, necessitated changes in the net fuel concept which has heretofore been incorporated in our civil agreements. The Spanish amendment was the first to incorporate a modification of the net transfer formula to reflect

the new situation. A further refinement of our thinking led to the revision of this formula in the Swiss agreement, through deletion of the final sentence of the provision in the Spanish amendment. The effect of the deletion is to include in the calculation under the Swiss agreement any negative result obtained in subtracting from the aggregate of the quantities of U–235 contained in recoverable uranium of U.S. origin, the quantity of U–235 contained in an equal quantity of uranium of normal isotopic assay. The decision to include this negative result in the calculation arose from the fact that it is possible, although perhaps not probable, that U.S.-supplied enriched fuel could be irradiated to a level below normal assay and that such irradiated material would be returned to the U.S. for processing under toll enrichment contracts. (Such returned material, which would have a negative value under the Swiss formula, would be counted as a "debit".) While such a situation may be unlikely to occur, the Commission felt that it should nevertheless take such a possibility, as well as the resulting demand on our diffusion plant capabilities, into account.

7. *Question.* Are you able to estimate the total quantities of U–235 which could be transferred to Spain and Switzerland under these bilaterals if all the enriched uranium were sold, as opposed to being furnished under an enriching service arrangement?

Answer. If the question refers simply to our ability to estimate quantitatively the amounts of U–235 transferred against the ceiling quantity under either a sale or toll enriching arrangement, the answer is in the affirmative. The method for determining quantities transferred employed in either agreement is essentially independent of the basis on which material is supplied. If, on the other hand, the question relates to whether we can estimate the quantitative impact of the availability of toll enriching, as opposed to sale only, on the growth rate of enriched uranium reactors in Switzerland and Spain, the response is in the negative. We believe, however, that toll enriching offers, under the current natural uranium market, a definite incentive for nuclear power and enriched uranium fueled reactors. This is particularly true in the case of a country such as Spain, which has substantial indigenous natural uranium reserves and a milling capability. For this reason, we feel that under toll enriching a larger amount of enriched uranium will be transferred by a given date than would be if such material could only be purchased or, conversely, that it will take longer to transfer the same amount of enriched uranium fuel on a purchase-only basis. We are not able to associate specific amounts of U–235 with this concept, however.

8. *Question.* Does the Commission plan to deviate from its announced policy of leasing (as opposed to loaning) enriched uranium and heavy water for research applications, other than for the DON project?

Answer. The Commission continues to maintain its policy of leasing enriched uranium and heavy water for research applications. The loan of such materials, as is being considered for the DON project, and as was done in the case of the three tons of heavy water provided for the Halden reactor (reported in our letter of February 19, 1965), are exceptional cases in which a departure from the normal policy could provide a particular benefit. While no projects other than the DON are now under consideration, it would not seem prudent to exclude the possibility that a particularly meritorious project might arise in which it would be in the interest of the U.S. to consider the loan of needed materials.

9. *Question.* In your prepared statement you referred to transfers of special nuclear materials to Spain for research applications, including reactor prototypes. Is there any limit on the size of these prototypes?

Answer. The provision in Article III–A of the Spanish amendment for the transfer of special nuclear materials for research purposes, including reactor prototypes (as well as research and materials testing reactors and reactor experiments) is not, of course, unique to the Spanish agreement. The provision was particularly noted in Commissioner Palfrey's prepared statement, along with the provision in Article IV of the Spanish agreement which would permit the loan of heavy water, in order to point out that these would be the applicable provisions under which arrangements being considered for the loan of heavy water and enriched uranium for the DON project would fall.

As in other agreements, enriched uranium transferred under this provision would be for such research applications, including reactor prototypes, as the Commission may agree to. No particular qualification as to the size of a reactor prototype has been established as a condition for the Commission's agreement and any projects put forward would be individually considered. Any enriched uranium supplied for a reactor prototype would, of course, be included in the total

quantity available under the agreement and could thus have a bearing upon the size of a reactor.

Senator GORE. Are there further questions?

If not, thank you, gentlemen.

This meeting is adjourned.

(Whereupon, at 11:30 a.m., Thursday, January 27, 1966, the subcommittee recessed, to reconvene at the call of the Chair.)

INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

THURSDAY, MAY 26, 1966

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON AGREEMENTS FOR COOPERATION,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C.

The subcommittee met at 2:30 p.m., pursuant to call, in room AE–1, the Capitol, Senator Albert Gore (chairman of the subcommittee) presiding.

Present: Senators Gore, Aiken, and Bennett; Representatives Hosmer and Bates.

Also present: John T. Conway, executive director; Edward J. Bause, assistant director; Leonard Trosten, staff counsel; George F. Murphy, Jr., national security affairs; James B. Graham, technical adviser; Jack Rosen, staff consultant; and William T. England, professional staff member.

PROPOSED CIVIL AGREEMENT FOR COOPERATION WITH TURKEY

Senator GORE. The committee will come to order.

The main subject of today's meeting of the Subcommittee on Agreements for Cooperation concerns a proposed amendment to the Civil Agreement for Cooperation with Turkey. I expect there will also be some discussion of the proposal to renew the existing U.S.-U.S.S.R. Memorandum on Cooperation in Peaceful Uses of Atomic Energy.

Before proceeding to hear from Atomic Energy Commission and State Department witnesses on these matters, I wish to note that, pursuant to committee practice, copies of the proposed amendment and certain supporting correspondence were published in the Congressional Record on May 19, 1966.

Without objection these materials, together with a floor statement which I made when submitting them for inclusion in the Record, will be included at an appropriate point in the record of this hearing.

(The statement referred to is set forth below; the text of the proposed Turkish agreement and correspondence in support thereof are set forth in app. 1, p. 139.)

[Reprinted from Congressional Record of May 19, 1966, p. 10517]

PROPOSED AMENDMENT TO AGREEMENT FOR COOPERATION WITH TURKEY

Senator GORE. Mr. President, it is the practice of the Joint Committee on Atomic Energy to inform the Senate when any proposed agreement for cooperation concerning the peaceful uses of atomic energy has been submitted to the Committee pursuant to § 123c. of the Atomic Energy Act of 1954. In accordance

with that practice I, as chairman of the Joint Committee's Subcommittee on Agreements for Cooperation, wish to inform the Senate that on May 3, 1966 a proposed amendment to this country's civil agreement for cooperation with the Turkish Republic was submitted to the Committee.

The amendment, which has been negotiated by the State Department and the Atomic Energy Commission and approved by the President, would extend the existing agreement for another five years, to June 9, 1971. Among the more significant revisions in the agreement which this amendment would effect, perhaps the most noteworthy is that providing for the transfer to the International Atomic Energy Agency of the responsibility for applying safeguards to materials and facilities transferred under the agreement for cooperation. Presently, safeguards against the diversion of these materials and facilities to military purposes are administered by the United States.

Under the terms of the Atomic Energy Act this amendment, together with certain proposed diplomatic notes which are considered part of the amending agreement, must lie before the Joint Committee for a period of thirty days while Congress is in session before becoming effective. It is anticipated that, in accordance with the general practice of the Joint Committee, a public hearing on this matter will be held prior to expiration of this statutory waiting period.

Mr. President, I ask unanimous consent to have printed at this point in the Record the text of the amendment to the agreement with Turkey, together with copies of the above-mentioned diplomatic notes and other supporting correspondence.

Senator GORE. Dr. Seaborg, I believe you are our leadoff witness. Please proceed.

STATEMENT OF DR. GLENN T. SEABORG, CHAIRMAN, ATOMIC ENERGY COMMISSION, ACCOMPANIED BY JAMES T. RAMEY, COMMISSIONER; R. E. HOLLINGSWORTH, GENERAL MANAGER; AND MYRON KRATZER, DIRECTOR OF THE DIVISION OF INTERNATIONAL AFFAIRS, ATOMIC ENERGY COMMISSION

Dr. SEABORG. Mr. Chairman and members of the committee, it is a pleasure to be here at this meeting of the Joint Committee to testify on the proposed amendment to the Agreement for Cooperation with Turkey, together with the diplomatic notes which are to be considered as part of the amending agreement.

TRANSFER OF SAFEGUARDS RESPONSIBILITY TO IAEA

In addition to extending the agreement for 5 years, until June 1971, a major purpose of the amendment is to provide for the transfer to the International Atomic Energy Agency of responsibility for applying safeguards to materials and facilities subject to safeguards under the bilateral agreement.

The 1965 amendment to the agreement expressly called for the Government of Turkey's decision on transferring safeguards responsibilities to the Agency. Turkey has agreed to such a transfer, and the transfer is specifically provided for in the proposed agreement.

The trilateral arrangements for implementing the transfer have been agreed to in principle by Turkey and negotiations of the transfer agreement with Turkey and the IAEA is proceeding.

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIAL

Two other provisions of the proposed amendment are in keeping with the practice in a number of other recent agreements. First, in accordance with the "private ownership" legislation of 1964, the

proposed Turkish amendment would permit authorized private parties in the United States and Turkey to make arrangements directly with each other for the transfer of special nuclear material.

As is the case in the agreement with Switzerland discussed earlier this year, the Commission will have discretion over such transfers by virtue of the requirement that the privately arranged transfers of special nuclear material be subject to applicable U.S. laws, regulations, license requirements, and policy.

AMENDMENT WOULD AUTHORIZE TRANSFER OF MORE HIGHLY ENRICHED MATERIAL

The other provision in the proposed Turkish amendment, which is also included in several of our other agreements, would permit the AEC to transfer enriched uranium as fuel enriched to more than 20 percent when there is a technical or economic requirement for doing so.

Under the present agreement, Turkey can receive enriched uranium containing 90 percent U^{235}. Under the new provision the standard enrichment of 93 percent being used by U.S. fuel fabricators may be transferred to Turkey.

Mr. Chairman, before concluding I would like to note that the first of the Agreements for Cooperation in Civil Uses of Atomic Energy to come into force in 1955 was that with Turkey.

SISTER LABORATORY ARRANGEMENT

The Turkish atomic energy program has centered around the U.S. reactor at the Cekmece Center. This facility was also the first to be covered by a sister laboratory arrangement which was undertaken by the Brookhaven National Laboratory on our side in 1962.

The contribution which this arrangement has made has been demonstrated by the fact that Turkey is now considering funding the arrangement itself when AID financing ceases later this year.

Mr. Chairman, I shall be pleased to answer whatever questions members of the committee may have.

TURKISH ATOMIC ENERGY PROGRAM

Senator GORE. I notice, Mr. Chairman, that you say that the Turkish atomic energy program has centered around the reactor supplied by the United States. Will you describe to the committee the Turkish atomic energy program?

Dr. SEABORG. It is centered mainly around the Cekmece Center near Istanbul which, by the way, I had the opportunity to visit last September, so I did have a chance to have a firsthand look at it.

The main facility is the U.S. reactor. They have an isotope laboratory—a laboratory for the processing of isotopes produced in their reactor and the packaging of those isotopes for use in other parts of the country, hospitals, and so forth.

They have a physics laboratory and a chemistry laboratory. It is a center where all the buildings are on one campus so to speak, and I think it is a rather effective, even though small, operation.

Senator GORE. Is it an adjunct to the university?

Dr. SEABORG. It is not an adjunct to any particular university. There is some cooperation with universities, particularly through the furnishing of isotopes to the universities, but it is a national laboratory.

Senator GORE. Senator Aiken?

Senator AIKEN. I might ask a couple of questions before I leave, Mr. Chairman.

CONSULTATION CONCERNING POSSIBLE UNITED STATES-TURKISH POWER AGREEMENT

Your letter of transmittal said that this amendment would clarify the existing agreement by explicitly stating the United States and Turkey "may" consult with each other, not necessarily "will" consult with each other, concerning a possible agreement covering nuclear power production. At whose behest was this change made, and why was it made?

Dr. SEABORG. I think that the Turkish people wanted it "may," just to leave them that much flexibility and leeway.

Senator AIKEN. However, it loosens up the agreement considerably as far as they are concerned?

Dr. SEABORG. No. This has to do with their possible adoption of U.S. nuclear power reactors and there is nothing in the agreement that would require them to adopt such reactors.

INFORMATION TO BE EXCHANGED

Senator AIKEN. What significance is there in the fact that this amendment speaks of an exchange of "scientific, technical, and economic information" in specified fields, whereas these agreements generally speak of simply an "exchange of information" in these fields?

Why are you specifying scientific, technical, and economic information, and how far could information be divulged under that provision?

Dr. SEABORG. I do not think that has any particular significance. That is the type of information that we usually exchange under these agreements. So in this amendment it was just spelled out a little more. There is no other particular significance to it.

Senator AIKEN. There is no possibility that you could furnish some blueprints of any——

Dr. SEABORG. Nothing of a classified nature.

Senator AIKEN. Nothing of that nature?

Dr. SEABORG. No; no such possibility.

Senator AIKEN. I think that is all, Mr. Chairman.

Senator GORE. Thank you, Senator Aiken.

Mr. Hosmer.

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIAL

Representative HOSMER. Dr. Seaborg, this permission to authorize private parties to make arrangements directly with Turkey for the transfer of special nuclear materials—what does that contemplate?

Mr. KRATZER. It flows from the private ownership legislation of 1964 which allows for the first time the possibility of direct exports of special nuclear material by private parties in the United States.

That would, of course, be under license by the Commission. Up until this time all exports of special nuclear material from the United States, since the Commission was the sole owner of the material, were made by the Commission itself.

We think it may be possible to simplify some of our transactions in fuel elements, for example, by allowing the fabricator who might have bought the special nuclear material from the Commission to sell it directly or to lease it directly; as the case may be, to the Government of Turkey. That would take place under our license, of course.

It does not change any of the substantive characteristics of the transaction. Through the licensing mechanism we will insure that all of the safeguard arrangements are applicable to the private transactions just as they are to the Government transactions, but we think it may simplify the procedures to the benefit of our industry.

TRANSFER OF FUEL FOR FOREIGN ATOMIC POWER PROGRAMS

Representative HOSMER. This proposed agreement for cooperation, would it also involve or cover the area of fuel for nuclear electric plants?

Mr. KRATZER. No, sir. This is a very limited agreement. There is not enough fuel here, nor is the wording in the agreement broad enough to cover powerplants.

Representative HOSMER. Are any of these arrangements the type that cover that kind of transfer?

Mr. KRATZER. You mean other agreements for cooperation? Yes; many of them are. We have two basic types, those called comprehensive agreements which provide substantial amounts of fuel for long periods of time for both research and power use, and then there is this other more limited type of agreement, of which this is an example, which provides only limited amounts of fuel for research reactor use.

NUMBER OF POWER AGREEMENTS IN EFFECT

Representative HOSMER. Now in connection with these that are of a different nature and do authorize transfers of large amounts for power use, are there a number of such agreements?

Mr. KRATZER. Yes, there are quite a large number. We have a total of 34 agreements. I don't have a breakdown in my mind of those which we classify as power and those which we classify as research but I would say that there probably are in the neighborhood of 15 agreements which we would classify as power agreements.

U.S. URANIUM PROCUREMENT PROGRAM

Representative HOSMER. Specifically, Dr. Seaborg, in that connection, I understand that the AEC, through its purchase program in the uranium concentrates, through the period of the contracts now in force to 1970, will have purchased about 610 million pounds of concentrates.

At the same time, the AEC has either disposed of or committed for disposal for reactors in the United States and Europe and in other foreign countries, about 115 million pounds, or roughly 25 percent of this supply. There is another part of the supply, of course, which has been diverted to the weapons program.

EFFECT OF POWER AGREEMENTS ON URANIUM SUPPLY

I understand also that there is some apprehension now that the domestic supplies of uranium are going to be inadequate to meet the needs of the power industry in the United States as it develops in the very near future.

Do you have any comments upon that general situation, and the bilaterals specifically in relation to it?

Dr. SEABORG. I do not know whether your figures are the exact figures.

Representative HOSMER. Mr. Hollingsworth indicates they are substantially correct.

Mr. HOLLINGSWORTH. Yes. They are of the right order of magnitude.

ADVANCED CONVERTER AND BREEDER REACTORS

Dr. SEABORG. It is because the supplies of uranium at moderate cost may be limited that we are developing advanced converters and breeder reactors, of course, as you know.

Representative HOSMER. The advanced converters are not going to help us over the next 20 years relative to the supply of fissionable material.

Dr. SEABORG. No. I think advanced converters are going to help us.

Representative HOSMER. They are not supposed to be pouring out much fissionable material until around the 1980 period and on, are they?

Dr. SEABORG. It depends on how they develop, but it is possible that we will begin to have more efficient use of our uranium through the use of advanced converters before 1980.

Representative HOSMER. You are going to be filling up pots with cores and it will be all put and no take for quite a while. You also look forward to a vast program of installation of thermal power-producing reactors which are also pots which are put and no take.

TOLL ENRICHMENT SERVICES

Dr. SEABORG. This was not my complete answer, of course. Then we are going to come under toll enrichment in a few years and we look forward to the discovery of additional amounts of uranium, at varying costs, from the moderate costs up to the more expensive costs.

Representative HOSMER. Will you give us an order of magnitude what you mean by moderate and what you mean by more expensive?

Dr. SEABORG. I suppose by moderate I mean $8 to $10 a pound and more expensive, running up to $15 and $20 a pound. That is where we would begin to use the advanced converters and, in the 1980's, the breeders.

COST OF URANIUM

Representative HOSMER. People are talking about $4.50 to $5.50 or $6 per pound uranium until 1970 under incremental production. Do you look forward, after 1970, to an $8 or $9 a pound cost?

Dr. SEABORG. I was just deliberately giving you conservative figures. I think there will be a good deal of uranium at prices below

$8 a pound. I was just indicating that if it went up to that level the indications are that nuclear power would still be economic, hence giving a leeway for a larger amount of uranium that might be found.

Representative HOSMER. One of the witnesses during the authorization hearings, and I believe it was Mr. Bokum,[1] painted a picture of some pretty severe shortages, stating that until you got your prices up around $8 or $9 a pound there just would not be any incentive or any funds to explore and develop except in areas that are adjacent to present mills and working deposits.

Dr. SEABORG. I don't know what he meant by our getting the prices up to $8 or $9 a pound.

Representative HOSMER. He said until the price gets up to $8 or $9 a pound.

Dr. SEABORG. Until the price gets up to $8 or $9 a pound. Well, that is why I used the figure of $8 or $9 or $10 a pound. You mentioned the possibility of lower priced uranium.

DRAIN ON U.S. URANIUM BY FOREIGN SALES

Representative HOSMER. We are going to hit a period, we are getting into it now, I think—there is one manufacturer alone in the United States who has over $1 billion worth of orders on its books from nuclear powerplants. They have on order 9 to 11 plants and the others have orders. There will be all these pots to fill up and people are wondering where the uranium is coming from to do it.

I think this poses a question, and I think the time is coming for the AEC to come to grips with this particular problem, since we have the prospect of these foreign sales that are going to take a sizable amount of material out of the country.

Mr. RAMEY. Mr. Hosmer, our director of raw materials testified in the authorization hearings [2] on what we were doing to encourage private industry to begin exploration for additional reserves that would become available, say, in the late seventies and eighties. We have this sort of anomalous situation that during the next 5, 6, or 7 years there is a bit of a surplus, shall we say, and then we are looking to the future.

AEC'S 1962 REPORT TO PRESIDENT

Representative HOSMER. That's if the projection of nuclear kilowatts is that which was predicted in the AEC's report to the President.[3] But if it escalates, which it appears to be doing, then we shrink this period of surplus supply and eventually switch it over into a shortage, and possibly at a very early time.

Mr. RAMEY. Yes, sir. And our testimony took that into account. Certainly, with this surge of orders they are exceeding by a considerable amount the estimate that we gave to the President in 1962 or even our estimates of 2 years ago.

We do have to take very seriously, and the atomic equipment industry and raw materials industry also, how we do obtain additional

[1] See JCAE hearings on AEC authorizing legislation, fiscal year 1967, pt. 2, p. 897 et seq., 89th Cong., 2d sess. (1966). Mr. Richard D. Bokum II is president of the United Nuclear Corp.

[2] See JCAE hearings on AEC authorizing legislation, fiscal year 1967, pt. 1, p. 60 et seq., 89th Cong., 2d sess. (1966).

[3] See "Civilian Nuclear Power: A Report to the President—1962" set forth, beginning at p. 305, in JCAE hearings on the development, growth, and state of the atomic energy industry, 88th Cong., 1st sess. (1963).

reserves. The Commission, of course, is in the situation that it will no longer, itself, be procuring large amounts of uranium in the 1960's. This is again for U^{235}. So that the private industry equipment companies now are moving in, looking to getting long-term orders for uranium raw material so that they are protected in taking care of atomic powerplants. And the raw material industry as a result of a number of discussions that have been held with them, are looking to see what should be done.

What we are looking to do, for example, is to provide some assistance in cooperation with the Geological Survey, in mapping on public lands looking for additional deposits, for example.

Representative HOSMER. You can map all you want but somebody is going to have to go out and dig the stuff up. The AEC is not going to do it.

Mr. RAMEY. Yes, but helping to know where it is is important on where you do your digging.

Representative HOSMER. Do you admit, however, that there was a conflict in the estimated adequacy of uranium supplies between the testimony of the AEC and at least certain of the witnesses from industry at these hearings?

Mr. RAMEY. I know Mr. Bokum has always taken the position that we haven't had as many reserves as has been estimated.

Dr. SEABORG. But I think Mr. Bokum would also like to sell uranium abroad.

Mr. RAMEY. I think he is selling it abroad.

U.S. POLICY CONCERNING DISTRIBUTION OF ENRICHED URANIUM ABROAD

Dr. SEABORG. He is selling it abroad.

Our policy is that of not restricting the sales of our uranium and going after the world market on the assumption that through a vigorous exploration program and through this program of developing reactors that use the raw material more efficiently; namely, first advanced converters and then breeders, that there will be an adequate supply of uranium.

Representative HOSMER. My point is that we are talking about the time when this demand is going to increase precipitously. It seems to be at an earlier time than we figured.

Now in this period to the 1970's where some people are working on incremental production, they can sell for $5 or $6 a pound and still make a profit, but they can't make enough money to carry on additional exploration and development. So, it looks like somehow before the 1970 period when the AEC contracts expire, unless this price goes up, there is going to be a shortage.

Incidentally, some of these projections of the amount of nuclear kilowatts that will be installed have developed since our authorization hearings.

Dr. SEABORG. There have been a number of utilities choosing nuclear power since the committee's authorization hearings. I do not think there has been a great change in our projections for 1980 since the authorization hearings.

SIGNING OF TARAPUR FUEL SUPPLY CONTRACT

Representative HOSMER. On May 5 Mr. Hall, your Assistant General Manager for International Activities, sent the committee a letter stating that the Tarapur reactor contract for fuel supplies was to be signed in the near future. Can you give us any clue as to when that might be consummated?

(The letter referred to follows:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., May 5, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: On July 1, 1965 we informed you that the Commission planned to execute the Tarapur fuel supply contract in the near future. Arrangements were made to sign the contract in September 1965 by members of the Commission on their return via India from the International Atomic Energy Agency's General Conference in Tokyo. However, the Indian-Pakistan hostilities started about that time and the signing of the Tarapur contract was deferred.

We are now proceeding with arrangements to execute the supply contract. The United States Ambassador to India, Chester Bowles, has requested that he be authorized to sign the contract on behalf of the U.S. in New Delhi upon his return to India. Necessary arrangements for signature of the contract by the Ambassador are being made with the Department of State.

If you have any questions on this matter, please let us know.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

Dr. SEABORG. It has been signed.

Representative HOSMER. When was it signed?

Dr. SEABORG. A week or two ago.

Representative HOSMER. So that is out of the way?

Dr. SEABORG. Yes.

RATIFICATION OF BRAZILIAN AGREEMENT

Representative HOSMER. Is your Brazilian agreement for cooperation out of the way now? (See p. 23.)

Dr. SEABORG. No, that is still under discussion.

EQUIPMENT FOR TARAPUR REACTOR SEIZED BY PAKISTAN

Representative HOSMER. What about those missing parts and pieces of the Tarapur reactor that presumably are being used for hitching posts over in Pakistan?

Mr. POLLACK. We reached an agreement on the release of all the AID-financed cargo which would include the equipment designed for Tarapur and we expect the negotiations on the actual mechanics for the release of this material to be completed in the near future.

Representative HOSMER. Do you know what is going to happen to those things now that they are being released?

Mr. POLLACK. We don't have a clean-cut answer. I inquired about that a while ago. It is possible they may be used by the manufacturer for another installation. I don't know whether that is technically possible or not.

Representative HOSMER. Did you reach the agreement with the Pakistanis recently?

Mr. POLLACK. I don't have the exact date. I believe it was recent.

Representative HOSMER. Last week?

Mr. POLLACK. The last week or so; yes, sir.[1]

Representative HOSMER. After my third complaint about these things?

Mr. POLLACK. I am sure that possibly had a stimulating effect.

Representative HOSMER. Thank you, Mr. Chairman.

(The following letter was subsequently received:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 15, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: The U.S. Embassy in Karachi has informed us that the Government of Pakistan has released the Tarapur equipment, including the air lock, for shipment out of Pakistan. Since equipment to replace all of that which was seized has been delivered to the Tarapur site and incorporated into the project, shipment of the seized equipment from Pakistan is awaiting the orders of the insurance underwriter's agent pending determination as to its final destination.

We will keep you informed of further developments in this matter.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Affairs.

Senator GORE. Congressman Bates?

TRANSFER OF SAFEGUARDS RESPONSIBILITIES TO IAEA

Representative BATES. Have you commented on this trilateral agreement and the opportunity for the United States or Turkey to terminate the bilateral agreement if arrangements respecting the transfer or safeguards responsibilities to the Agency can't be worked out?

Dr. SEABORG. No; not specifically other than my statement that this is taken care of in the exchange of diplomatic notes.

Representative BATES. What gives rise to that sort of arrangement?

Dr. SEABORG. They preferred to do it that way. Mr. Kratzer will amplify that.

Mr. KRATZER. Let me explain first of all, Mr. Bates, that the basic provision that either party has the right to terminate the agreement in case we do not agree on the terms of a trilateral transfer arrangement with the IAEA is presently in all of our agreements.

We felt this was necessary because at the time ——

Representative BATES. Any new agreement?

Mr. KRATZER. All of our new agreements.

Representative BATES. How about your present arrangements with Turkey? You don't have any such unilateral rights, do you?

Mr. KRATZER. Yes. I believe this was included in the amendments that we executed last year, 1965. There was no such provision in the Turkish agreement before that time.

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[1] Subsequent to the hearing Douglas MacArthur II, Assistant Secretary of State, wrote to the committee under date of June 7, 1966 to furnish the following information:

"In response to Representative Hosmer's question during the hearings, Mr. Pollack stated that agreement had recently been reached with Pakistan on the release of the AID-financed cargoes seized during the Kashmir dispute. We find on further checking that agreement in principle to the release of the cargoes had actually been reached in January. In the interim as Mr. Pollack stated during the hearing negotiations have been underway on the mechanics to effect the release of the cargoes. We are happy to report that these arrangements have now been largely completed and that the Tarapur equipment itself has been located in good condition. We are informed by AID that shipment of this equipment from Pakistan is expected to take place in the near future."

RIGHT OF TERMINATION

Representative BATES. Could either side originally terminate the agreement?

Mr. KRATZER. No; they could not originally. Beginning in 1965 when we amended the Turkish agreement and extended it for 1 year to the present date, we put that provision in. Now when we agree with a country, as we have in the case of Turkey, that we will request the IAEA to administer the safeguards, we have to recognize that there is still a small chance that for some reason or another that trilateral agreement cannot be brought into effect.

That has never happened and I am sure it never will but the possibility is there. To guard against that possibility and to make sure that all parties do their utmost to reach this agreement, we need to have this kind of provision.

In this particular case, Turkey requested that it be in the form of a diplomatic note which in fact is legally a part of the agreement and we acceded to that request. (See app. 1, p. 142.) Their reason for that is simply that, having agreed to the transfer of safeguards to the Agency, they saw no possibility that it would not be carried out and it was sort of going a bit too far to imply in the very agreement where they have agreed to this transfer that something might come amiss.

Representative BATES. A year ago you extended this for 1 year?

Mr. KRATZER. That is right.

Representative BATES. This time it is for 5 years?

Mr. KRATZER. This is for 5 years; yes.

TERM OF TRILATERAL SAFEGUARDS AGREEMENT

Representative BATES. And IAEA is for 10 years?

Mr. KRATZER. No; the transfer agreement will be for the life of this bilateral. In other words, the trilateral agreement for transfer of the safeguards will be for the same period of time as the bilateral agreement.

Representative BATES. I understood here from the information we have before us that the bilaterals ordinarily involve the transfer of safeguards to the IAEA for a term of 10 years.

Mr. KRATZER. That is correct; when the bilateral is for a period of 10 years. It is our normal practice at the present time to extend research agreements for 10 years. We offered to do that in the case of Turkey but it was their preference that it be extended for only 5 years.

AMENDMENT TO TURKISH AGREEMENT IN 1965

Representative BATES. I see. Last year it was 1 year. Why was it 1 year?

Mr. KRATZER. That was a period during which Turkey was reaching its decision as to whether or not it could agree to the transfer of safeguards to the International Agency. In those circumstances we never agree to a long-term bilateral arrangement.

We want to keep the leverage on the other party to make sure that this agreement on transfer of safeguards is reached.

Representative BATES. So this year you gave them an opportunity for 10?

Mr. KRATZER. That is right.
Representative BATES. They preferred 5?
Mr. KRATZER. They preferred 5.

OBTAINING NUCLEAR FUEL FROM THE IAEA

Representative BATES. Now this trilateral arrangement you have, is this a different course of action from the one you contemplated at one time where you hoped to get away from bilaterals, as I understood it, and have these third countries obtain their enriched uranium needs through the IAEA?

Mr. KRATZER. Certainly the IAEA statute makes it possible for the Agency to serve as a supplier of nuclear fuel which has been made available to it by member states who have it.

We have a bilateral agreement with the Agency providing it with 5,000 kilograms of uranium 235 which it can make available to countries such as Turkey if it wants to do so.

It has never been our policy to require that other countries use the Agency in this brokerage role. In fact, our experience has been, and this is the result of a decision which we reached about 1961 as I recall, that by separating the supply role of the Agency from the safeguards role, which we consider to be its really important function, we have had much more success in getting people to agree to Agency safeguards.

Representative BATES. Was it that or was it the brokerage aspect?

Mr. KRATZER. The brokerage thing complicated matters. The countries did not in general want to have the complication of dealing with a middleman.

Representative BATES. And the cost?

Mr. KRATZER. The cost was a questionable factor.

Representative BATES. Wasn't that 4 percent?

Mr. KRATZER. No, sir; the Agency has the right under its statute to make a charge for its supply service but, in fact in the few instances where it is doing so, where it is supplying material, it has not made any charge.

Representative BATES. But wasn't that a 4-percent levy that they contemplated?

Mr. KRATZER. I don't know. The 4 percent was the use charge on our own material.

Representative BATES. We talked about this 5 or 6 years ago, I remember.

Mr. KRATZER. Yes; it was discussed on several occasions. The Agency could well apply a surcharge. They decided not to do so but in other cases they might.

CHARGES INCURRED BY TURKEY FOR USE OF U.S. MATERIAL

Representative BATES. In the instant agreement now, who is actually paying for the material that might be involved in these transfers?

Mr. KRATZER. The Turkish Government will pay for the materials. Since this is a research reactor, the material is normally provided on a lease basis. They pay us for all consumption and loss, and they pay us the standard AEC rental charge of 4¾ percent annually on the value of the material which they have.

Representative BATES. What does the AID program pay for?

SISTER LABORATORY ARRANGEMENT

Mr. KRATZER. The AID program has been financing the cost of what we call a sister laboratory arrangement which is a technical assistance arrangement, in this case carried out by our Brookhaven Laboratory.

Representative BATES. This is the reactor they had over there?

Mr. KRATZER. This is centered around the reactor. It is designed to insure that the reactor is utilized effectively. That is the principal purpose of the sister laboratory arrangement.

Representative BATES. Do I understand the funding arrangement now has ceased?

Mr. KRATZER. It has not as yet. I believe it is in its second or third year. It is running out. It appears that Turkey will be willing to pick up the cost of it in the future.

Representative BATES. Are we funding any other portions of this agreement?

Mr. KRATZER. No, sir. This is all on a self-sustaining basis at this time.

This was a reactor, a grant-type reactor, and they received at the time of its completion in 1962 a $350,000 grant.

Senator GORE. Chairman Seaborg, is this Turkish reactor justifiable economically, or is it a prestige matter for Turkey?

RESEARCH REACTOR PLAYING IMPORTANT ROLE IN TURKISH SCIENCE

Dr. SEABORG. It is a research reactor. I think, having been there, that it is more than a prestige matter. It forms a nucleus for carrying on modern scientific research, and it is playing a very important role in Turkish science.

Senator BENNETT. Mr. Chairman, I have been there, too. Is it not also used as a base for some teaching?

Dr. SEABORG. Yes, and, of course, for the production of isotopes as I mentioned earlier that are used in a number of places in Turkey, in hospitals and so forth.

Senator GORE. Have we not had a number of requests for reactors of a small order which requests may well have been stimulated by national prestige?

Dr. SEABORG. Yes.

Senator GORE. I am not saying that this should not be given consideration.

Dr. SEABORG. No. I think a number of them were stimulated by national prestige but I think that in most cases, nearly all cases, where the reactor was actually purchased and installed, that the real research value has been apparent.

It has been more than a research value in the limited nuclear field; it has in many instances served as a focal point for modern 20th century science in the country and has been followed by the acquisition of modern scientific equipment in other fields.

Of course, the research reactor is a very versatile piece of equipment. It has broad interdisciplinary application. It can be used, of course, in physics, experiments in neutron physics and reactor physics. It can be used in chemistry experiments, in the use of tracers and other application, and it can be used in medical and biological research.

It has applications to engineering research and agriculture, and it is probably as good an example of interdisciplinary research, and broad application, as there is in modern science.

So, I think that usually, although there is the possibility that it was originally conceived of as a prestige item, in nearly every case it has turned out to have good value in basic research and in practical and engineering research.

Senator GORE. Perhaps this would be an appropriate point to have Mr. Pollack of the State Department give any prepared statement he may have. Mr. Pollack, do you have a general statement?

Mr. POLLACK. I have a very brief one which I would appreciate an opportunity to make.

Senator GORE. You may proceed.

STATEMENT OF HERMAN POLLACK, ACTING DIRECTOR, INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL AFFAIRS, DEPARTMENT OF STATE, ACCOMPANIED BY JOHN P. TREVITHICK, ATOMIC ENERGY AFFAIRS; ROBERT B. HOUSTON, BUREAU OF EUROPEAN AFFAIRS; AND ALEXANDER SCHNEE, OFFICE OF CONGRESSIONAL RELATIONS

Mr. POLLACK. The Department has participated with the Atomic Energy Commission in negotiating the amendment which is before you today and in recommending its approval to the President.

The amendment is in all respects fully consistent with our policy on international cooperation in the field of the development of peaceful uses of atomic energy, including our desire to extend as rapidly as possible the application of the safeguards system of the IAEA. We believe this agreement represents another step in the right direction.

USE OF ACCOMPANYING DIPLOMATIC NOTES

Senator GORE. What is the reason for using diplomatic notes in this case to accomplish what you would normally achieve within the four corners of an agreement for cooperation? (See app. 1, p. 142.)

Mr. CONWAY. Senator Gore is referring to the note which provides that in the event you can't get an agreement on transfer of safeguards to the International Agency, the bilateral may be terminated. Normally, you put that in the agreement for cooperation; in this case it is not in the agreement for cooperation.

Dr. SEABORG. This was preferred by the Turks in this case. They had agreed to the transfer.

Senator GORE. Does it broaden the scope of the agreement?

Dr. SEABORG. I would not say it broadens it. It is a matter of preference. They had agreed to the transfer of safeguards to the IAEA, and they felt that if we had to nail this down specifically in the agreement itself, it amounted to a lack of faith on our part and they would feel better if it could be handled this way through an exchange of diplomatic notes.

Senator GORE. So there is no sense of change?

Dr. SEABORG. No sense of change and it is just as effective. This is what they preferred and we thought it served our purpose just as well.

Senator GORE. Mr. Ramey, do you have a statement you wish to add?

Mr. RAMEY. No, Senator Gore.

Senator GORE. Are there any other questions?

CONTINUATION OF SAFEGUARDS AFTER EXPIRATION OF AGREEMENT

Dr. Seaborg, in view of your opinion that safeguards continue on U.S. reactors transferred abroad even after the expiration or termination of the agreement under which they were exported, why don't these notes explicitly provide that any safeguards on U.S.-supplied reactors will continue if the agreement is terminated?

Dr. SEABORG. We don't have any reactors yet except this one research reactor.

Mr. KRATZER. It is as you say, Senator, our view that the very language of these agreements provides that the safeguards continue after the agreements expire. I think we tend to feel that it might raise some doubt on that score if we began to explicitly include this fact in the agreement at this time because we have a large number of agreements in effect, some 30-odd, which don't contain any such language.

We found in general that when the agreements do expire, the other party does acknowledge that the safeguards continue in effect and we have in fact exercised safeguards in cases where agreements have expired.

Mr. CONWAY. Would it be of value at the time of expiration to right then and there get an agreement in writing?

Dr. SEABORG. Your question and our response in a public forum like this also makes clear what our intention is in that regard.

Mr. CONWAY. That is one of the purposes for raising the question.

(The following letter concerning the Turkish amendment was subsequently received:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 9, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This is in reference to the amendment to the U.S.-Turkish Agreement for Cooperation on which a hearing was held May 26.

As you know, the expiration date of the Agreement is June 9. Unfortunately, because of campaigning activities for the forthcoming election in Turkey, the Government of Turkey has not been able to obtain all of the necessary Ministerial signatures on the ratification papers which will permit the exchange of notes to bring the amendment to the Agreement into force. We have been assured, however, that there will be no difficulty in doing so as soon as the campaigning activities permit.

In the meantime, we have obtained from the Government of Turkey a diplomatic note stating that it recognizes the continuing effect of the safeguards and guarantees provisions of the Agreement for Cooperation and will hold any materials, equipment, and devices it has received under the Agreement subject to the terms and conditions of the Agreement and of the applicable subsidiary arrangements thereto pending the coming into force of the amendment.[1]

[1] A copy of the diplomatic note delivered by Turkey concerning the continuation of safeguards during the hiatus between expiration of the basic agreement and entry into force of the amendment is set forth in app. 5, p. 17.9

We shall advise you as soon as the notes have been exchanged to bring the amendment into force.[1]

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

Senator GORE. Mr. Chairman, would you like to make some reference to the proposed new agreement with the U.S.S.R.?

BACKGROUND OF UNITED STATES-U.S.S.R. EXCHANGE PROGRAM

Dr. SEABORG. Yes. I wonder whether it would be worthwhile for me to give a little background for this agreement? Do you want to go into it to that extent?

Senator GORE. I think it might be well unless there is objection. Also, if there is no objection, I think we should include at this point in the record copies of two letters which the committee has received from the Commission concerning this matter.

(The letters referred to follow:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., March 7, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This is to inform the Joint Committee that the Department of State is currently meeting with the Soviets in Washington to renew the US–USSR Exchanges Agreement in Scientific, Technical, Educational, Cultural and Other Fields.

The last three US-USSR Exchanges Agreements (November 24, 1959; March 8, 1962; and February 22, 1964) have contained references to the Memoranda on Cooperation in the peaceful uses of atomic energy in that section of the Agreement describing scientific exchanges. The purpose of this letter is to inform the Joint Committee that the Commission has approved the language in the following paragraph, which the State Department will include as an item in the scientific section of the 1966–67 Exchanges Agreement:

"Both Parties will take all appropriate measures in order to encourage and achieve the fulfillment of * * * any new Memorandum on Cooperation in the Field of the Peaceful Uses of Atomic Energy which may be concluded by the United States Atomic Energy Commission and the USSR State Committee on the Utilization of Atomic Energy, subject to approval by the two governments in the usual manner, and which may be appended to this Agreement as an addendum."

Since the AEC-USSR State Committee Memorandum on Cooperation for 1963–65 terminated on December 31, 1965, the AEC staff is preparing a new draft Memorandum. We shall keep the Joint Committee informed on developments in this matter.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., May 19, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: The Joint Committee was informed by letter of March 7, 1966, that a Soviet delegation had arrived in Washington to negotiate a new exchange agreement. The Committee was also informed that the AEC was preparing a new draft Memorandum on Cooperation in the Field of the Peaceful Uses of Atomic Energy.

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[1]According to information supplied by the AEC on July 19, 1966, the aforementioned amendment was brought into force on July 5, 1966, when the United States and Turkey exchanged notes stating that each Government had complied with all statutory and constitutional requirements for the entry into force of the agreement.

On March 19, 1966, the US-USSR Exchanges Agreement was signed. As indicated in the March 7 letter, the Agreement contains a paragraph which provides for the AEC and the USSR State Committee for the Utilization of Atomic Energy to establish and appropriate exchange arrangement. The specific language of the Agreement in this regard is as follows:

EXCHANGES IN THE FIELD OF SCIENCE

"(1) Both Parties will take all appropriate measures in order to encourage and achieve the fulfillment of:

"(*c*) A Memorandum on Cooperation in the Field of the Peaceful Uses of Atomic Energy which may be concluded by the United States Atomic Energy Commission and the USSR State Committee on the Utilization of Atomic Energy, a copy of which will be appended to this Agreement as an addendum."

In furtherance of the US–USSR Agreement, the AEC has developed a new draft Memorandum on Cooperation, a copy of which is attached. A copy of the Memorandum of May 21, 1963, which will be replaced, is also attached for your information. While the draft Memorandum is similar to the 1963 document in many respects, there are a number of changes which are summarized below:

a. *Exchange of Delegations.*—This type of exchange was formerly titled "Exchanges of Specialist Visits." It is renamed in order to distinguish these exchanges from the specialized exchanges discussed in item b. below. The fields of exchange include carryovers from the 1963 Memorandum as well as six new fields. The arrangements for these exchanges remain the same except that the maximum duration of a delegation's stay is increased from 15 to 20 days.

b. *Exchanges of Specialists Visits.*—This is a new type of reciprocal exchange. Visits of up to two weeks by two or three specialists would be arranged in specified areas of the fields in which exchanges of delegations have taken place under either the 1963 Memorandum or will have taken place under the new Memorandum. For example, delegation visits in the field of low energy physics have recently been completed and we could propose to the Soviets visits in the specialized area of "fast-time-of-flight techniques."

c. *Research Assignments.*—This type of exchange was titled "Exchange of Research Specialists" in the 1963 Memorandum. Successful research assignments in high energy physics and controlled thermonuclear reactions have taken place and it is now proposed that two to three specialists in the fields of high flux reactors and solid state physics participate in research for periods up to one year.

d. *Visits by Invitation.*—We have proposed a more flexible type of exchange in the field of high energy physics. The Committee was informed of this type of exchange by letter of July 12, 1965 and, as stated therein, we believe it would be advantageous to both the U.S. and U.S.S.R. if there were an increased interchange of scientists in the field of high energy physics.

e. *Exchange of Information.*—We propose to continue the rather modest exchange of documents which has been conducted during the past two years and include in the new draft a proposal that the Parties provide, in addition, up to five documents per month upon specific request.

f. *Joint Conferences.*—This section of the Memorandum remains the same except that the sites of the two conferences have been reversed.

g. *Exchange of Instruments.*—This section has been eliminated as neither side evidenced any interest in an exchange of this nature during the life of the 1963 Memorandum.

h. As you may have noted, the provision of the over-all Agreement concerning the AEC-State Committee Memorandum does not require that the Memorandum be subject to approval by the two Governments. Similarly, the provision of the new Memorandum concerning possible agreement on additional proposals does not require further approval of the Parties to the Agreement. As a matter of practice, however, we find it most convenient and effective to use U.S. diplomatic channels in our dealings with the State Committee.

This draft is being forwarded to the State Committee for comment and we anticipate that there may be changes before a mutually acceptable version is reached. We shall keep the Joint Committee currently informed of developments in this matter and, as the attachment is our interim document in this negotiation, we would appreciate that its distribution be limited to the Committee and Committee staff.

Cordially,

GLENN T. SEABORG, *Chairman.*

Enclosures: (1) Copy of 5/21/63 memo on cooperation [see app. 6, p. 180]. (2) Copy of draft memo on cooperation [omitted; on file with JCAE].

Dr. SEABORG. The official United States-Soviet bloc exchange program was established pursuant to a decision by the National Security Council and announced by President Eisenhower on June 29, 1956, when he stated that the United States would seek exchanges with the countries of Eastern Europe, including the U.S.S.R.

Formal implementation of this national policy, with respect to the Soviet Union, first came about through the U.S.-U.S.S.R. 1958–59 Agreement for Cooperation in the Scientific, Technical, Educational, and Cultural Fields.

This was signed on January 27, 1958, by Ambassador William S. Lacy and Soviet Ambassador George Zaroubin. It provided for a large number of exchanges. For the most part, exchanges under the 1958–59 agreement were implemented successfully. However, these did not primarily concern the AEC.

EXCHANGES IN THE NUCLEAR ENERGY FIELD

The U.S.-U.S.S.R. cooperation in the field of the peaceful use of atomic energy was first proposed during the visit of Khrushchev in September 1959. At that time the United States proposed broader exchanges in several fields of atomic energy, and AEC Chairman McCone and Professor Emelyanov, Chairman of the U.S.S.R. counterpart of our Atomic Energy Commission, agreed to recommend that their Governments arrange for a program of nuclear exchanges.

AREAS OF RECIPROCAL EXCHANGE

On November 24, 1959, Chairman McCone and Professor Emelyanov signed this first memorandum on cooperation which provided for reciprocal exchanges in four areas: visits, information, joint enterprises, and instruments.

The McCone-Emelyanov memorandum was established as an addendum to the 1960–61 U.S.-U.S.S.R. Agreement for Cooperation in Exchanges in the Scientific, Technical, Educational, and Cultural Fields, and the committee was kept abreast of all these developments in connection with the McCone-Emelyanov agreement.

Following conclusion of the McCone-Emelyanov agreement, as the committee knows, in 1963 I was invited by Mr. Petrosyants, the chairman of the U.S.S.R. State Committee for the Utilization of Atomic Energy, to go to the Soviet Union and negotiate and sign a follow-on agreement (see app. 6, p. 180) and to tour a number of nuclear installations in the Soviet Union. In company with a distinguished group of scientists from the United States we visited 14 sites, including 10 large scientific installations during the 11-day period of that visit.

Now, this visit resulted in a return visit by Chairman Petrosyants to the United States in November of 1963. During the past 2 years we have implemented that agreement with a number of successful exchanges involving delegations and research assignments and documents.

Groups consisting of 7 to 10 specialists have visited scientific establishments in the United States and the U.S.S.R. on this reciprocal basis.

Representative HOSMER. How many?

Dr. SEABORG. Seven to ten in each group, the group that went to the Soviet Union and the Soviet group that came here, for visits on

the order of 10 days to 2 weeks. Visits have been completed both ways in the following fields: Nuclear power reactors——

EXCHANGES OF DELEGATIONS

Representative HOSMER. Excuse me, but are we talking about this subdivision known as the exchange of delegations?

Dr. SEABORG. This is the subdivision known as the exchange of delegations. I will mention in a moment the exchange of scientists to conduct experimental work and then there is another way; the exchange of documents. This is the area of exchange of delegations.

There have been six or seven such exchanges of delegations. We have completed the exchanges both ways in the fields of nuclear power reactors, plasma physics, low-energy physics, solid state physics, and radioactive waste disposal.

We are halfway through an exchange in the field of radioneurology; that is, a U.S. team of radioneurologists visited the Soviet Union last September. We plan to receive a Soviet team in the next month or so, and we plan to carry out an exchange of teams in the field of medical tracers also in the next month or two.

Approximately 100 scientists from both sides have participated in these visits.

Representative HOSMER. Is that the total?

Dr. SEABORG. That is the total in these exchanges.

Representative HOSMER. Both United States and Soviet, 50–50?

Dr. SEABORG. You mean is the total 50 each way? Yes. Not 100 each way.

Representative HOSMER. You mean there was 100 including both United States and Soviet?

Dr. SEABORG. Yes.

Representative HOSMER. Out of the 100 how did the exchange come out?

Mr. HOLLINGSWORTH. We have actually had seven more scientists over there than they have had over here.

Dr. SEABORG. I think the number is 97, and the breakdown is 45–52. That is the way it happened to fall.

Now let me summarize briefly——

Senator GORE. You would not say that they have a qualitative advantage?

Dr. SEABORG. Certainly I would not say that.

Representative HOSMER. These delegations consist of more than the agreed scientific people, do they not?

Dr. SEABORG. They all have scientific——

Mr. RAMEY. Engineers.

Dr. SEABORG. Engineer? That was not the answer he wanted.

Representative HOSMER. Political scientists.

Dr. SEABORG. I am searching for the word. They contained protocol people. They contain people who are equivalent to the people in our Division of International Affairs, for example.

EXCHANGE OF SCIENTISTS

Now we will go to the area of exchange of scientists to actually carry on experiments for periods of 3 to 6 months. There have been three Soviet high-energy physicists that have completed assignments at

Cambridge and Brookhaven, and a similar number, three American scientists, that have completed assignments at Yerevan and the Institute of Theoretical and Experimental Physics in Moscow, similarly for 3- to 6-month periods.

Also, an American specialist in controlled thermonuclear reactions completed a 3-month visit at the Lehedev Physics Institute in Moscow, and a second physicist in the field will complete his 6-month assignment in Kharkov next week.

The Soviets have not yet nominated their personnel for their reciprocal visits which will take place at the Thermonuclear Laboratory at Princeton and at the Lawrence Radiation Laboratory in Berkeley.

That is the status of the exchange of experimental scientists, scientists who actually work in the laboratories of the host country.

EXCHANGE OF DOCUMENTS

In the field of documents, these are exchanged under the terms o the memorandum with shipments of about 10 to 12 documents going each way on a fairly regular basis each month. These documents include reports and books and monographs in the unclassified literature in the fields in which we have agreed to exchange delegations.

They also include a lesser number of dissertations in the five specialized fields. Today a total of 438 documents has been received by us, and we have forwarded a total of 410 documents to the Soviet Union.

The documents received from the Soviet Union are incorporated in "Nuclear Science Abstracts" and therefore, of course, can be made available to scientists throughout the United States and throughout the world.

A portion of the Soviet documents are obtained in this way and usable in the United States before, and in some cases long before, they would be obtained by other sources the way we used to do it before the exchange of documents.

Representative HOSMER. What was the prior method?

Dr. SEABORG. I think it was to write for them when we learned of their existence and request the documents. A lot of it was on a scientist-to-scientist basis. In addition, our Division of Technical Information has exchange arrangements with some 25 Soviet institutions.

That is a summary of what has gone on up until now. It is an active exchange. I think it has been a very satisfactory exchange.

Senator BENNETT. While you are talking about documents, which nations turn out the most abstracts?

Dr. SEABORG. I would say the United States. It is a rather large margin, I know that. I don't know the statistics. But it is the United States.

Senator GORE. You abide strictly by the law with respect to the transfer of classified information?

Dr. SEABORG. Yes. I should emphasize this: this is not classified information. It is information, I should say, that would otherwise be available to either side, but this expedites it and makes the information available much sooner than it would be otherwise and also systematizes it.

Senator GORE. Insofar as the United States is concerned?

Dr. SEABORG. I would say the chief advantage, yes, sir, is to the United States in that respect.

Senator GORE. Do our scientists who have visited there feel that it has been beneficial to our applied science?

Dr. SEABORG. Yes; they do. I and other members of the Atomic Energy Commission and the staff have met with each of these delegations of some 7 to 10 scientists after they have returned from the Soviet Union and they have uniformly been well satisfied with the reception that they received and with the information that they received.

Of course, in many cases they established contracts for continuing scientist-to-scientist exchange of information.

Senator GORE. Thank you, Doctor.

Are there any further questions?

COST OF U.S. PARTICIPATION IN EXCHANGE PROGRAM

Senator BENNETT. I would like to ask if the Chairman will submit for the record some itemization of the cost to the United States and compare the cost today with the cost as it was when the program was begun.

Dr. SEABORG. We will be glad to do that. (See p. 68.) I suppose that would be largely travel costs.

QUALITY OF INFORMATION EXCHANGED BY RESPECTIVE PARTIES

Senator BENNETT. I am also curious to know if there is an appreciable difference in the quality of information that comes with this exchange. Are they getting better and more important information from us than we get from them or is it across the board, 50–50?

Dr. SEABORG. I think relative to what is available on each side there is an equality of exchange. We are getting good, very interesting information in a number of instances.

Senator BENNETT. Which means that the scientific level of their work which is reported in these documents is approximately equal to ours?

Dr. SEABORG. In a number of instances. I would hate to try to compare it overall. I don't know how the average is. Sometimes theirs is better, sometimes ours is better.

Senator BENNETT. In general you think there are some instances where it is enough better so that you ——

Dr. SEABORG. In some instances it is better than ours; yes.

Representative BATES. Have we tried to get any information on any particular programs or exchange any individuals and permission was denied or the individuals turned down?

Dr. SEABORG. These areas, of course, that I mentioned, these six or seven areas are agreed-upon areas. I don't know of any instance where we have asked for information that we have any reason to believe is available that we have not received it. I don't know of any. Certainly, none of the people that we suggested be members of teams to go to the Soviet Union have been turned down.

There may have been instances where we have invited a scientist from the Soviet Union who has not yet accepted the invitation and come to the United States.

Representative BATES. That was on his part?

Dr. SEABORG. It was on his part; yes.

Representative BATES. Within the spectrum of your agreements you have not had a denial of information?

Dr. SEABORG. No; we have not.

Representative BATES. Or entertaining of any program within the guidelines that you had set forth previously?

Dr. SEABORG. No. We have had postponements, but we have not had any denial. So far, they have always eventually come through.

NEW UNITED STATES-U.S.S.R. EXCHANGES AGREEMENT

Representative HOSMER. Dr. Seaborg, I understand on March 19 of this year an agreement was signed between the United States and the U.S.S.R. containing a paragraph that indicated that under it would come a future agreement relative to specific matters such as you mentioned, the exchange of delegations, personnel, and so forth, this to be covered by what is known as a memorandum of cooperation. (See p. 52.)

Dr. SEABORG. Yes.

Representative HOSMER. Is that what you are really telling us now, that you have a new memorandum of cooperation?

Dr. SEABORG. We are now in the process of discussing or just ready to discuss with our counterparts in the Soviet Union a draft memorandum on cooperation. They suggested that we write the draft memorandum and then they would study it and make any comments and suggested changes and hopefully then that would be signed again—I don't know under what circumstances but perhaps again by Mr. Petrosyants and myself, either in the Soviet Union or in the United States.

Representative HOSMER. This would replace the 1963 Seaborg-Petrosyants agreement? (See app. 6, p. 180.)

Dr. SEABORG. This would replace the 1963 agreement. We have prepared such a draft.

Representative HOSMER. Would you tell us then why it is necessary to modify this 1963 agreement?

MEMORANDUM ON COOPERATION OF 1963 TO BE EXPANDED

Dr. SEABORG. We are just going to change the subjects and expand it to another area or two.

Representative HOSMER. In other words, we can look forward to an increasing number of these exchanges that heretofore have been carried on and a broader spectrum of subjects to be covered? Is that the intent?

Dr. SEABORG. A somewhat broader spectrum of subjects to be covered—possibly a slight increase. Although the exchange rate has been rather optimal, it has been a rather steady exchange rate, and I don't think either of us is looking for a very substantial increase in the rate.

Representative HOSMER. What is the value to the United States of doing whatever it is you have in mind doing, which I understand you don't want to talk about in public?

Dr. SEABORG. The only reason for that is that we have not yet disclosed to the people in the Soviet Union what we are suggesting in this memorandum. We think we should——

Representative HOSMER. Certain expansions are being suggested?

Dr. SEABORG. Yes.

Representative HOSMER. What I am trying to do is find out of what value it is to the United States to indulge in this expansion.

Dr. SEABORG. Well, these fields are—let me give you one example. I would think that they would not mind this. We would like to exchange information with them and visit in the field of the transplutonium elements, as an example. They are carrying on a very extensive program there.

We have been interested in that field for a long time. We think it would be of great value to us to have our scientists in this field visit with their scientists in this field. We would like to think it would be of value to them.

MILITARY IMPLICATIONS OF INFORMATION ON TRANSPLUTONIUM ELEMENTS

Representative HOSMER. Are there any military implications whatsoever in connection with transplutonium elements?

Dr. SEABORG. In the area where we are going to exchange visits, which is in the region of the heavier transplutonium elements particularly, I don't see any military implications. Of course, there are military implications of plutonium, itself, in nuclear power.

Representative HOSMER. My question was limited to the transplutonium elements, the heavier ones. I am wondering what value there is in what information we are getting about them.

Dr. SEABORG. In this case the chief value is analogous to that in the exchange of information in high-energy physics, namely, the increase of knowledge about nature, the increase of knowledge about nuclear and atomic structure.

That is the chief value in the case of transplutonium elements.

Representative HOSMER. When you went into the transuranium field the first thing you did was hit an ingredient for the bomb?

Dr. SEABORG. Yes.

Representative HOSMER. When you get into a transplutonium element I would think there is a possibility that there are military implications in this area.

Dr. SEABORG. I think the possibility for military implications is rather peripheral. These would be isotopes which are already well known, say, as power sources in SNAP devices, isotopes like curium 244.

Senator GORE. Would you yield, Mr. Hosmer?

Representative HOSMER. Yes.

POSSIBLE DISCOVERY OF ELEMENT 104

Senator GORE. I would like to inquire, is it true the Commission thinks that it may be possible or likely that the Soviets have discovered or created or isolated element 104?

Dr. SEABORG. It is quite possible. In their laboratory at Dubna, where they have a very large group of scientists working, they have

bombarded plutonium with neon-ions in their heavy ion cyclotron and produced an isotope which they believe might be an isotope of element 104, with a mass number of 260 and which decays by the spontaneous fission process with a half life of about 0.3 of a second.

Very recently they have succeeded through rather clever experiments, despite the very short half life of this isotope, in making some chemical experiments with it which are certainly consistent with its being element 104.

I would say that if these physical experiments to produce it and the chemical experiments can be confirmed in another laboratory, then the Soviets will have discovered element 104 and they will then have the privilege of suggesting a name for this element.

Senator GORE. Do you think it will be Khrushchev?

Dr. SEABORG. No, I don't think so.

Representative HOSMER. Dr. Seaborg, I don't want to hold you much longer but, since you have made a quantitative analysis of these exchange documents for us, I think it might be interesting for some kind of qualitative comparison.

Dr. SEABORG. I think there is some kind of equalizing effect in this exchange. I believe that they are qualitatively similar.

CURRENCY OF DOCUMENTS EXCHANGED

Representative HOSMER. Let us pinpoint this a little further. Did your 1963 agreements provide that the exchange of documents should be current documents?

Dr. SEABORG. I think the implication is that they should be current documents.

They do include even some dissertations, that is Ph. D theses before they are published, as an illustration of that.

Representative HOSMER. You send them current documents, I assume?

Dr. SEABORG. Yes.

Representative HOSMER. Is it not a fact that someone in the AEC made a complaint that the Russian documents were not of a current nature?

Dr. SEABORG. I am not familiar with it, but it is quite possible.

Representative HOSMER. Did anybody in the AEC ever express general disappointment about the documents that they were receiving?

Dr. SEABORG. If they have, it has not come to my attention but I don't say that it has not happened. Just as perhaps somebody in the Soviet Union may have expressed disappointment with the documents that we sent them. But I think on the whole there has been satisfaction both ways.

Representative HOSMER. Have you picked up anything of value relative to power reactors?

Mr. RAMEY. We have certainly learned something about their program on superheat work where it looked like I think for a while they were doing better than we were but apparently some of the people over there seem to think that they were starting to run into some of the same troubles we have encountered.

Representative HOSMER. You are satisfied that you are both doing poorly, is that it?

Mr. RAMEY. That sometimes happens in research and development.

PUBLICATIONS AVAILABLE IN AEC'S PUBLIC DOCUMENT ROOM

Representative HOSMER. Dr. Seaborg, the AEC has a document room here in Washington, does it not?

Dr. SEABORG. Yes.

Representative HOSMER. Are all unclassified publications of the AEC available at that document room, or at least substantial numbers of them?

Dr. SEABORG. Well, in the technical field I think it would be only a small fraction of them. We have I don't know how many technical documents but it must be 100,000 now.

Mr. KRATZER. Some years ago it was 40,000.

Dr. SEABORG. I suppose we have more than 100,000 technical documents.

Representative HOSMER. How does a member of the public avail himself of one or more of these 100,000 documents?

Dr. SEABORG. Through our Division of Technical Information and I would say usually through "Nuclear Science Abstracts."

Representative HOSMER. Those are published abstracts?

Dr. SEABORG. Those are abstracts published semimonthly, which have appeared for the last 18 years.

Representative HOSMER. Are these furnished free or at some cost? Not the abstracts but the papers themselves.

Mr. HOLLINGSWORTH. I believe it is at some cost, a nominal cost.

Representative HOSMER. Are there any restrictions on the purchase of those unclassified documents?

Dr. SEABORG. I think not.

Representative HOSMER. There is nothing to prevent any representative of any foreign government from purchasing these documents?

Dr. SEABORG. I think when they are unclassified and when they are available and not in extremely short supply that there isn't any restriction.

Mr. HOLLINGSWORTH. I might point out most of these documents are made available, a great number of them, through the Clearinghouse for Federal Scientific and Technical Information in the Department of Commerce and the Superintendent of Public Documents at a nominal fee.

Representative HOSMER. Are any of the documents that you exchange under these arrangements with the Soviets documents which cannot be obtained in the manner that you have related?

Dr. SEABORG. I think not. I believe that these are all available to the general public through these channels.

Representative HOSMER. Are there any serious differences in the time that they are available?

Dr. SEABORG. No; I don't think so. I think that these become available to the public—they are published documents so they are available to the public as soon as they are to the Soviet scientists.

Representative HOSMER. Insofar as the Soviet Union is concerned the only possible advantage to them in connection with the documents is the small amount of money and trouble they would have to go to purchase them; is that correct?

Dr. SEABORG. I think it must be a great convenience, however, to have them brought together in this way and sent to them.

Representative HOSMER. What do you do, pick out the 10 a month that are the best sellers or something?

Dr. SEABORG. No——

Representative HOSMER. Obviously you are publishing more than 10 a month?

Dr. SEABORG. Yes, we are.

Representative HOSMER. I think obviously they are picking up all you publish, aren't they?

Dr. SEABORG. That I don't know. I doubt it. I would not think that they would be interested in everything we publish.

Representative BATES. Do you have any condensation of results that you have reduced to writing yourself, that could be incorporated in the record in respect to these eight fields?

Dr. SEABORG. The results of the visits, for example?

Representative BATES. Yes.

Dr. SEABORG. Yes.

SUMMARY OF VISITS OF SPECIALISTS TO SOVIET UNION

Representative BATES. Do you have that which you could put in the record that you believe would be of interest?

Dr. SEABORG. I don't think we have any condensation that would be suitable for the record, but I think we could make one.

For example, we made a trip report of the visit of the group that I headed to the Soviet Union in May of 1963. You may have seen that. That is about that thick. [Indicating its thickness.]

It gives a quite complete coverage of our visit. I think we could abstract these reports to any predetermined length for the record if you should request it.

Representative BATES. I would not want you to go to any great effort but if there are conclusions and I presume there have been——

Dr. SEABORG. It may be that on occasion there are conclusions that could be rather easily made available.

Representative BATES. They could be lifted from reports and put in?

Dr. SEABORG. We will do that.

Representative BATES. It might give us a better comprehension of exactly what value this information might be.

That is all I have.

(The following letter and enclosures were subsequently received:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 27, 1966.

Hon. ALBERT GORE,
Chairman, Subcommittee on Agreements for Cooperation,
Joint Committee on Atomic Energy,
Congress of the United States.

DEAR SENATOR GORE: During the hearings before the Subcommittee on Agreements for Cooperation, on May 26, 1966, concerning the U.S. proposal to renew the existing Memorandum on Cooperation with the Soviet Union, members of the Subcommittee requested additional information on several aspects of the exchanges with the Soviet Union. I am pleased to forward the further information which was requested.

With regard to the summaries of the visits of specialists to the Soviet Union, I should mention that the Joint Committee on Atomic Energy is routinely provided with detailed reports of these visits as soon as reports are completed.

I am also including a summarization of the visit of the Atomic Energy Delegation in May 1963, which I had the pleasure to head, although the primary objective

of the visit was to sign the Memorandum on Cooperation rather than to visit Soviet scientific centers under the terms of the Memorandum.

If there is additional information which the Subcommittee desires on this matter, please let me know.

Cordially,

GLENN T. SEABORG, *Chairman.*

Enclosures: (1) Summary of Specialists Visits. (2) Qualitative Evaluation of Documents. (3) Program Costs.

SUMMARY OF SPECIALISTS VISITS TO SOVIET UNION PURSUANT TO THE MEMORANDUM ON COOPERATION

I. U.S. ATOMIC ENERGY DELEGATION—MAY 1963—10 MEMBERS

Itinerary

Moscow State University
Lebedev Physics Institute, Moscow
Chemical Physics Institute, Moscow
Kurchatov Atomic Energy Institute, Moscow
Institute of Physics and Power Engineering, Obninsk
Scientific Research Institute of Atomic Energy Reactors, New Melekess
Khlopin Radium Institute, Leningrad
Ioffe Physical-Technical Institute, Leningrad
Yefremov Scientific-Technical Institute for Electrophysical Apparatus, Leningrad
Novevoronesh Nuclear Power Station
Kharkov Physical-Technical Institute
Joint Institute for Nuclear Research, Dubna
Site of Serperkhov 70-Bev Proton Synchrotron
USSR Academy of Sciences, Moscow
State Committee on the Utilization of Atomic Energy, Moscow

Summary

All members of the Delegation felt that the trip was quite rewarding and worthwhile. A considerable amount of new information and insight into the Soviet Union's programs in nuclear energy was gained. Not only were a number of sites visited which never before were seen by Western groups but tours of institutes and installations previously visited were also in general more extensive and complete.

As was evident, the exchange of scientific ideas and information is welcomed by the Soviet scientific community. The enthusiasm with which the Delegation was greeted by Soviet scientists and Soviet people met during the visit was notable. Discussions with members of other AEC delegations returning from the Soviet Union indicate that these scientific teams are uniformly well treated when visiting in the USSR. This gives us reason to believe that science represents a positive link which can be advantageously used to bridge the gap that now exists between the two societies.

A few specific conclusions regarding the Delegation's visit to the Soviet Union's nuclear sites can be made. Noticeably different in approach from this country was the tendency to consolidate in several large institutes all the research in a scientific field. For example, the Kurchatov Atomic Energy Institute is quite large and equal to the largest national laboratories in the U.S. In the U.S., although there are several national laboratories, there is also a strong effort to diversify nuclear energy research into the many universities and colleges of the country in order to conduct research in conjunction with the training and education of new scientists. This did not appear as evident in the U.S.S.R.

With few exceptions, the lack of experimental equipment in the large experimental facilities visited by the Delegation was noticeable. It was the consensus of the group that the experimental gear had been removed for the visit in an attempt to give an impression of orderliness. This was unfortunate, since it would have been of more scientific benefit to see the equipment and discuss the experiments in more detail.

Contrary to the U.S. program, there is little biological work (or at least little was shown). Although this was not one of the main interests of the members of the Delegation, the only indication that biological work in the atomic energy program was being conducted was at the Kurchatov Atomic Energy Institute where they had recently begun a biology program. The only other biological work that was seen was at the Chemical Institute of the Academy of Sciences.

The Delegation had known prior to the trip that the Soviet attitude regarding nuclear safety was somewhat different than that in the U.S. Whereas the Soviet Union is as sensitive to the inherent dangers connected with the handling of radioactive isotopes either in fission product studies, radiochemical work, or hot cell studies, they take a decidedly different attitude toward nuclear reactor safety. During the visit to the nuclear reactors in the Soviet Union, no air-tight containment structures were seen. The prevalent attitude apparently is that, once a reactor has been safely designed, it is safe and reactor accidents cannot happen. Also, reactors are built extremely close to one another, such as at Novovoronezh and New Melakess, in order to take advantage of common facilities such as water lines or ventilation systems. On the other hand, the Soviets are concerned with exposure of workers to radiation. The normal work week for such employees in the Soviet Union is 35 hours, compared to a 40 hour average elsewhere in the U.S.S.R. Paradoxically, at no point in the Delegation's visit were the members given film badges or other dosimeters, hard hats, or safety shoes, although numerous construction sites and radiation areas were visited.

The final conclusion of the Delegation was that the Soviet Union's nuclear energy program is competent and that in many areas a very ambitious and aggressive attitude is in evidence, such as in high-energy accelerators, controlled thermonuclear reactions, and transuranium research. It was clear that the Soviet scientists are quick to assess the value of any newly discovered device, theory, or principle, and then to attempt to improve upon the original discovery. In this way they are among the leaders in such fields as alpha spectroscopy, neutron capture gamma ray work, and the discovery of new transuranium elements and isotopes. The Soviet Union will for a time have the world's highest energy electron linear accelerator at Kharkov and the world's highest energy proton accelerator at Serpukhov. All signs point to their continued determination to excel in their nuclear energy program.

2. PLASMA PHYSICS AND CONTROLLED THERMONUCLEAR FUSION—FEBRUARY 1964—10 MEMBERS

Itinerary

Leningrad Physical-Technical Institute
Scientific Research Institute of Electro Physical Apparatus, Leningrad
Physical-Technical Institute, Sukhumi
Physical-Technical Institute, Kharkov
High Temperature Institute, Moscow
Kurchatov Atomic Energy Institute, Moscow

Summary

The Plasma Physics and Controlled Thermonuclear Delegation visited the five major research centers where most of the Soviet effort in this field is carried out.

The immediate impression of the Delegation, verified statistically during the visit, was the rather spectacular growth in manpower and facilities devoted to controlled fusion research, which had occurred in the period since a previous visit in July 1960. The total effort in terms of numbers of professional scientists and engineers was estimated to be nearly twice that involved in the U.S. program.

An outstanding feature of the Soviet effort was the large number of highly competent theoretical physicists actively engaged in the program. Theoretical groups at Kharkov, at the Kurchatov Atomic Energy Institute in Moscow, and at Novosibirsk contained large numbers of unusually talented young men as well as men of established reputation. A major topic of theoretical effort was nonlinear theory of plasma behavior dealing, for example, with the problem of turbulence. In this field Soviet effort and progress is much greater than that in the U.S.

About half of the total Soviet experimental effort in controlled-fusion research was concentrated at the Kurchatov Institute. This activity is dominated by Academician L. A. Artsimovich and includes the largest array of toroidal confinement machines in the world, the sequence of Tokomak machines; the two largest magnetic mirror machines, OGRA I and OGRA II; and a large number of smaller experimental devices for injecting, heating and confining plasma. The stabilization of the hydromagnetic flute instability by a Minimum-B mirror type of field was first demonstrated by Dr. M. S. Ioffe of this group.

At the Physical-Technical Institute at Kharkov under Academician K. D. Sinelnikov the experimental program has mainly been concentrated on the study of beam-plasma interactions, the development of plasma guns and a method of heating a plasma by ion cyclotron resonance.

At the Physical-Technical Institute at Sukhumi plasma research under the direction of Dr. E. A. Demirkhanov includes a continuing study of the linear pinch and the development of an intense source of 50 Kev hydrogen ions; but of greater interest are the experiments on the interactions of high frequency fields with plasma, both for heating and for stabilizing the plasma.

In a cooperative program in Leningrad the Physical-Technical Institute carries out a wide variety of small projects aimed at an understanding of plasma phenomena, the measurement of atomic cross sections of interest in controlled fusion and the development of techniques for diagnosing the properties of a plasma. The Physical-Technical Institute also provides scientific assistance to the Yefremov Scientific-Technical Institute of Electrophysical Apparatus, where a number of major experimental devices have been built. Effort was initially concentrated on the plasma produced in a very large magnetically stabilized pinch device and has more recently shifted to two large installations built for the study of the interaction of intense high-frequency fields with plasma.

The Soviet experimental program includes effort in nearly all features of the U.S. program but with some differences in emphasis. The Soviet effort is strikingly greater in the study of interactions of plasma with intense high-frequency fields. However, there is very little Soviet effort on the Theta pinch such as the Scylla device of Los Alamos or the utilization of high energy electrons as in the Astron at Livermore.

3. SOLID STATE PHYSICS—JUNE 1964—7 MEMBERS

Itinerary

Institute for Physical Problems, Moscow
Institute of Theoretical & Experimental Physics, Moscow
Ioffe Physical Institute, Leningrad.
Semiconductor Institute, Leningrad
Institute of Physics, Tbilisi
Institute of Physics, Kiev
Physical Technical Institute, Kharkov
Lebedav Physics Institute, Moscow
Institute of Metal Physics & Physical Metallurgy (Kurdumov), Moscow
I. V. Kurchatov Atomic Energy Institute, Moscow
Moscow State University

Summary

The Solid State Physics Delegation visited 12 institutes and university research centers in Moscow, Leningrad, Tbilisi, Kiev, and Kharkov during its 16-day stay in the USSR. In view of the limited time available and the diversity of research carried out, it was necessary to split the Delegation into two or more groups at most sites in order to survey the research activities and, unfortunately, it was rarely possible for discussions in depth to be carried out on research of mutual interest.

Research which the team found of interest included low temperature physics, high pressure physics, Fermi-surface mapping, optical spectroscopy of solids, and theory. In addition the team learned of neutron scattering studies of solids being conducted while the samples were being subjected to high pressure, although a description of the equipment was not given.

Much of the research on metals appeared to be practically oriented and was carried out on polycrystalline samples although some single crystal work was discussed which required material of very high quality. In several instances research equipment was observed which was manufactured in the USSR but which were copies of foreign (non-Soviet) designs. Compared to the U.S. program, only a limited amount of radiation damage research (other than semiconductors) was encountered.

4. PURIFICATION AND DISPOSAL OF RADIOACTIVE WASTE PRODUCTS—NOVEMBER 1964—8 MEMBERS

Itinerary

Beloyarsk Nuclear Superheat Power Station, Sverdlevsk
Moscow Radioactive Waste Treatment Plant
Khlopin Radium Institute, Leningrad
Moscow Institute of Physical Chemistry
Institute of Radiation Hygiene of the Ministry of Health, Leningrad
Institute of Physics and Power Engineering, Obninsk
Novovoronezh Nuclear Power Station, Novovoronezh
Kharkov Waste Storage Plant
I. V. Kurchatov Atomic Energy Institute, Moscow

Summary

The Waste Disposal Delegation was provided the first opportunity for American scientists and engineers to observe and discuss the nature and extent of Soviet radioactive waste management activities. The scope of the site visits was essentially limited to the handling, treatment, and disposal of low activity waste materials which emanate from laboratory research institutes and power reactor operations. Observation and discussion of high-activity waste management activities were not included in this technical exchange (at Soviet request) because these operations are an integral part of their "industrial" (classified) facilities.

From a scientific or technological standpoint no new or significant information on radioactive waste management systems or techniques was obtained; however, the Delegation did observe conventional treatment practices, involving the use of chemical precipitation, ion exchange and evaporation at both laboratory research and power reactor installations. In disposal operations, considerable conservatism was evidenced in the Soviet policy of storing slightly contaminated solid waste in concrete underground tanks in regional burial grounds, as exemplified by the Kharkov Waste Storage Plant. Some departure from this procedure was noted, in that relatively recent authorization was being granted for the "direct disposal" of certain slightly contaminated wastes at specific locations.

Extensive discussions were held on the use of international radiation protection standards and their relationship to Soviet "sanitary norms." These norms are generally comparable to the "maximum permissible concentrations" of radioactivity used in the U.S. In Soviet terminology, waste effluents containing concentrations of radioactive material less than the "sanitary norms" are considered, by definitions, to be nonradioactive.

It appeared that Soviet waste management operations were unduly restrictive in regard to the qunatities of radioactive material discharged to the environment. The extensive waste treatment systems for low activity wastes at the power reactors visited, the nature and scope of the waste stroage facility at Kharkov where minute quantities of radioactive materials were being stored in underground tanks (a physician on full-time duty was reported for this site), and the proposed recycle of treated effluents at the Novovoronezh power station,—all are indicative of this generally conservative operating philosophy.

5. NUCLEAR POWER REACTORS—DECEMBER 1964—10 MEMBERS

Itinerary

Kurchatov Atomic Energy Institute, Moscow
Scientific Research Institute of Atomic Energy Reactors, New Melekess
Institute of Physics and Power Engineerlng, Obninsk
Novovoronezh Nuclear Power Station, Novovoronezh
Beloyarsk Nuclear Superheat Power Station, Sverdlovak

Summary

The Delegation visited five major installations associated with nuclear power production or development in the Soviet Union and, in addition, held discussions with the State Committee of the USSR for the Utilization of Atomic Energy. The facilities visited included radiochemical, metallurgical and liquid metal laboratories, critical experiments, two test reactors, and six experimental power reactors, in addition to the major power stations at Novovoronezh and Beleyarsk.

The discussions of Soviet nuclear power technology, of nuclear power plant design, and of reactor operation results were the most extensive ever held between representatives of the two countries. The visit provided broad contact with Soviet scientists working in power reactor development and related fields and an opportunity to exchange views in many areas of technology, experimental tech-

niques, and nuclear safety philosophy. Facilities included some, particularly those at New Melekess, which had not previously been seen by U.S. representatives.

6. RADIONEUROLOGICAL RESEARCH—DECEMBER 1965—7 MEMBERS

Itinerary

Burdenko Institute of Neurology, Moscow
Central Institute for the Advanced Training of Physicians, Moscow
Institute of Higher Nervous Systems, Moscow
Institute for Scientific X-Ray and Radiological Research, Leningrad
Spolenov Neurosurgery Institute, Leningrad
Institute for Experimental Medicine, Leningrad
Pavlov Institute of Physiology, Leningrad
Institute of Biophysics of the USSR, Moscow
Institute of Medical Radiology, Obninsk
Joint Institute of Nuclear Research, Dubna

Summary

The Delegation found that research on radioneurobilogy in the Soviet Union is not organized in terms of a central program. Some research is supported in Institutes related to the Academy of Sciences and some in Institutes of the Academy of Medical Sciences. At the installations visited by the Delegation, the initiation of a program in radioneurobiology research seemed to depend on the institute director and the interests of the investigator. This lack of coherence appears to stem from the fact that the State Committee for the Utilization of Atomic Energy does not itself support research in the Biomedical Sciences.

It was clear that the USSR was making a major effort to overhaul and upgrade its biomedical research. Four of the Institutes visited were under expansion in terms of both buildings and personnel, and probably also of mission. Except for specific isolated instances Soviet biomedical research is not up to U.S. standards and the Soviet researchers are, in fact, largely copying and/or repeating what has been done in the U.S. The Soviets are, however, catching up rapidly and their younger men are capable, clever, and relatively unhampered by chauvinistic scientific dogma.

In the area of radioneurobiology, outmoded Pavlovian theory remains as a strong influence; however, there is close agreement with the U.S. that the central nervous system is sensitive to surprisingly low amounts of X- and gamma-radiation when tested by functional techniques and rather insensitive when tested by histologic techniques.

7. NUCLEAR PHYSICS, PHYSICS OF LOW-ENERGY PARTICLES—FEBRUARY 1966—10 MEMBERS

Itinerary

Kurchatov Atomic Energy Institute, Moscow
Lebedev Physics Institute, Moscow
Yefremov Scientific-Technical Institute for Electrophysical Apparatus, Leningrad
Kiev Institute of Physics
Kharkov Physical-Technical Institute
Institute of Theoretical & Experimental Physics, Moscow
Institute of Physics and Power Engineering, Obninsk
Joint Institute of Nuclear Research, Dubna
Khlopin Radium Institute

Summary

The Low Energy Physics Delegation visited nine Soviet laboratories during the two-week visit. The exchange clearly permitted the most comprehensive review yet made by U.S. scientists of the status of nuclear physics in the USSR.

The visit at the Lebedev Physics Institute included a thorough examination of the photonuclear program. A new electron linear accelerator for this program was scheduled to be assembled in several months. At Dubna, the Delegation was most impressed with the activity of the Laboratory of Nuclear Reactions under the direction of Professor Flerov. This Laboratory has a large and strong effort on the identification of new elements and the study of the properties of heavy nuclides. The impression received was that they are attempting to outclass the U.S. in this area (the Soviets recently announced the discovery of element 104).

At Kharkov and Kiev, the current accelerator facilities are not up-to-date by U.S. standards, but the Delegation learned of plans for a new 20 Mev tandem Van de Graaff accelerator for Kharkov and both a tandem Van de Graaff accelerator and a 100 Mev proton cyclotron for Kiev. The U.S. Delegation found the neutron physics program at Obninsk to be comprehensive and first-rate. The first of the Soviet tandem Van de Graaff accelerators being installed at Obninsk was seen.

The Delegation covered many topics of nuclear physics and heavy element research in the Soviet laboratories, found many of the physicists to be very competent and much of the research work to be of high quality. As noted above, at some laboratories the facilities were not currently up-to-date by U.S. standards.

Qualitative Evaluation of Documents Received From U.S.S.R.

All documents received from the Soviets under the Memorandum on Cooperation are abstracted and included in *Nuclear Science Abstracts* if these publications have not been received previously and are within the subject scope of the abstract journal. Since the reading audience of *Nuclear Science Abstracts* is diversified and world-wide, and since these particular publications are not specifically identified, no special analysis is made concerning their quality or their value to the reader. The inclusion of these documents does, of course, improve the coverage provided by *Nuclear Science Abstracts*.

In addition to the above procedure, upon receipt of the Soviet documents in AEC Headquarters, the titles are translated and the English titles are circulated to the Headquarters program divisions for translation recommendations. Over the past year some 111 publications have been recommended for translation, of which some 65 have been completed and forwarded to the divisions.

The consensus of the recipients of the translated documents reflects that in some areas of research important new information is conveyed, whereas in others there is little specific or technical information although the state-of-the art is indicated. By far, the large majority of the documents are of recent publication date; however, in some cases the reported work may not be current. All respondents are agreed as to the value of these documents as a means of identification of the work of individual Soviet scientists and their institutes. It was also generally agreed that the document exchange is of value in establishing channels of communication which can be enhanced in the future.

Summary of Program Costs, Calendar Years 1960–1965

The following tabulation gives the approximate cost to the United States by years for participation in the program of exchange under the AEC–USSR States Committee Memorandum on Cooperation:

1960	$19, 900	1964	$53, 600
1961	0	1965	47, 900
1962	0	1966	[1] 30, 900
1963	36, 600		

[1] Estimated for first six months only.

1960—In this year the US sent a 5-member High Energy Physics Team and a 5-member Controlled Thermonuclear Research Team to the USSR. Two Soviet teams in the same fields came to this country. Costs to the US associated with these exchanges were primarily for the travel and transportation of the US team members to the USSR and for US escorts accompanying the USSR teams.

1961–62—No exchanges occurred in these years.

1963—$36,600 was incurred for expenses during the visit to the US by Chairman Petrosyants and his party of 9 members and for travel and transportation to the USSR by Chairman Seaborg and a party of nine persons and for two AEC employees who traveled to Moscow to negotiate the Memorandum on Cooperation.

1964—In this year four US teams totaling 35 members, traveled to the USSR—(1) Radioactive Waste Management Team, (2) Solid State Physics Team, (3) Controlled Fusion Team and (4) Nuclear Reactor Team—while Soviet teams for Plasma Physics and Solid State Physics, visited this country. The cost of $53,600 was primarily for travel and transportation in connection with these visits.

1965—Exchanges in 1965 included a visit by a US Radioneurology team of 7 members to the USSR, the assignment of three US scientists to the USSR for three months and of a fourth scientist for a six-month period, and visits to the US by three Soviet teams for Nuclear Power Reactors, Radioactive Waste Disposal and Low Energy Physics. About $34,500 of the $47,900 was attributable to the long-term assignments of personnel (salaries, transportation, per diem and miscellaneous costs), with the remainder primarily for travel and transportation in connection with the team visits.

1966—From January 1, 1966 to June 15, 1966 one US Low Energy Physics team of 10 members had visited the USSR and one six-month assignment of a US scientist to the USSR was made. A visit by a six-man Soviet Medical Tracer team to this country will take place during the last week in June and the first week in July. The cost of these exchanges to date is estimated to be $30,900.

Representative HOSMER. Dr. Seaborg, in the negotiations of this memorandum with the Soviets, do you intend to inform the committee of any changes?

Dr. SEABORG. We have already.

Representative HOSMER. That may be made during the process of the year?

Dr. SEABORG. During the process? Yes.

Representative HOSMER. So that the record will be clear. We do have the draft but we want to be kept up to date, if you will.

Dr. SEABORG. We will do that.

Representative HOSMER. The committee is also interested in having the opportunity to discuss in executive session with you and your people any points regarding it.

Dr. SEABORG. Certainly. We stand ready to do that right now if you wish.

Mr. RAMEY. Mr. Hosmer, I might mention, since you are covering various aspects of the exchanges, and we discussed this I believe in the authorization hearings on the desalting arrangements, we entered into an agreement with the Soviets in November or December of 1964 but it has not been implemented by them.

We have been in touch with them about doing so but we have not heard from them.

Representative HOSMER. Is this in confirmation of the testimony you recently gave the committee about the paucity of papers coming from the Soviets in this regard?

Mr. RAMEY. Yes, sir. This is just to keep you up to date.

We still haven't heard from them.

Representative HOSMER. We could get into the Mexican agreement but I think that would take the rest of the afternoon.

Dr. Seaborg, thank you.

The meeting is now adjourned.

Dr. SEABORG. Thank you.

(Whereupon, at 3:55 p.m., Thursday, May 26, 1966, the hearing was adjourned, subject to call.)

INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

TUESDAY, JUNE 28, 1966

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON AGREEMENTS FOR COOPERATION,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C.

The Joint Committee met at 11 a.m., pursuant to call, in room A–1 of the Capitol, Senator Albert Gore (chairman of the subcommittee) presiding.

Present: Senator Gore and Representatives Holifield, Price, Hosmer, Anderson, and Young.

Also present: John T. Conway, executive director; Edward J. Bauser, assistant director; Leonard M. Trosten, staff counsel; George F. Murphy, Jr., national security affairs; and William T. England, professional staff member.

Senator GORE. The committee will come to order.

PROPOSED CIVIL AGREEMENTS FOR COOPERATION WITH THE UNITED KINGDOM AND THE PHILIPPINES

There are three proposed agreements for cooperation before the subcommittee this morning, two of them with the United Kingdom. Of the British agreements, the first would amend the existing civil research agreement to extend its term for another 10 years and authorize the transfer to the United Kingdom of an additional 2,000 kilograms of U^{235} for fueling research reactors; the other British agreement is completely new and would establish a cooperative arrangement in the civilian power field. Under this agreement the United States would be authorized to transfer up to 8,000 kilograms of enriched uranium during the next 10 years for use in the United Kingdom's civilian power program, including merchant marine propulsion.

The third proposed agreement is with the Republic of the Philippines and would effect an amendment to the existing agreement requested by the Philippine Government.

Copies of these three agreements together with their supporting correspondence have been published in the Congressional Record and without objection will be included at an appropriate point in the record of this hearing. (See app. 1, p. 121.) Without objection we will also include in the record brief explanatory remarks I made on the floor of the Senate when submitting these documents for the Congressional Record.

(The statements referred to are set forth below:)

[Reprinted from Congressional Record of June 21, 1966, p. 13109]

PROPOSED AGREEMENTS FOR COOPERATION WITH UNITED KINGDOM

Mr. GORE. Mr. President, as Chairman of the Joint Atomic Energy Committee's Subcommittee on Agreements for Cooperation, I wish to inform the Senate that pursuant to section 123 c. of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to the Joint Committee the following: A proposed new agreement for cooperation in the civil power applications of atomic energy with the Government of the United Kingdom, and an amendment to the existing agreement for cooperation with the United Kingdom on the civil uses of atomic energy. Both the proposed new agreement and the amendment were received by the Joint Committee on June 2, 1966.

Section 123 c. of the Atomic Energy Act requires that these proposed agreements lie before the Joint Committee for a period of thirty days while Congress is in session before becoming effective.

The proposed amendment to the existing civil agreement, which will expire on July 21, 1966, would extend the basic agreement for a period of ten years. The principal objective of the amendment is to permit the transfer by the United States of an additional 2,000 kilograms of U–235 for fueling reactors in the United Kingdom's civil research and development program.

The proposed new civil power agreement would have a term of ten years, and provides for the transfer by the United States of up to 8,000 kilograms of U–235 during that period for use in the United Kingdom's civilian nuclear power program. The agreement further provides that the International Atomic Energy Agency will be requested to assume responsibility for applying safeguards to the materials transferred under the agreement.

It is the general practice of the Joint Committee to publish proposed civilian agreements for cooperation in the Record and to hold public hearings thereon. In keeping with this practice, I ask unanimous consent to have printed in the Record the text of these agreements together with supporting correspondence.

[Reprinted from Congressional Record of June 27, 1966, p. 13717]

PROPOSED AMENDMENT TO AGREEMENT FOR COOPERATION WITH THE PHILIPPINES

Mr. GORE. Mr. President, I wish to inform the Senate that the Atomic Energy Commission and Department of State have submitted to the Joint Committee on Atomic Energy a proposed amendment to the civil agreement for cooperation between the United States and the Republic of the Philippines. The amendment was received by the Joint Committee on June 25, 1966 and, together with two proposed agreements for cooperation with the United Kingdom which I submitted for the Record on an earlier date, will be the subject of a hearing before the Subcommittee on Agreements for Cooperation tomorrow morning at 11 a.m.

The primary purpose of the Philippine agreement is to authorize the transfer to that country of nuclear materials enriched to more than 20 percent when there is a technical need for such material in the Philippine civil research program. Under the present agreement there is a ceiling of 20 percent on such enrichment.

In keeping with the Joint Committee's practice of publishing civilian agreements for cooperation I ask unanimous consent that the Philippine amendment and certain supporting correspondence be printed in the Record.

Senator GORE. Dr. Seaborg, will you please lead off.

STATEMENT OF DR. GLENN T. SEABORG, CHAIRMAN, ATOMIC ENERGY COMMISSION, ACCOMPANIED BY JOHN G. PALFREY AND GERALD F. TAPE, COMMISSIONERS; R. E. HOLLINGSWORTH, GENERAL MANAGER; JOHN A. HALL, ASSISTANT GENERAL MANAGER, INTERNATIONAL ACTIVITIES; AND MYRON B. KRATZER, DIRECTOR, DIVISION OF INTERNATIONAL AFFAIRS

Dr. SEABORG. Mr. Chairman and members of the committee, it is a pleasure to be here at this meeting of the Joint Committee to testify on the proposed new agreement for cooperation in the civil power applications of atomic energy with the United Kingdom and on the proposed amendment to the agreement for cooperation with the United Kingdom.

There has been close consultation with this committee and its staff in the development of these agreements, and we appreciate the constructive contributions which have come from these consultations.

As the members of the committee know, our cooperation with the United Kingdom in atomic energy matters dates back to the early years of World War II. The close and effective working relationships which were established under the difficult conditions of those years were renewed and expanded after 1955, when our first agreement for cooperation with the United Kingdom was brought into effect.

Our joint efforts in many areas of the nuclear program in recent years have been mutually beneficial and have promoted our objectives toward wider international cooperation in the peaceful uses of atomic energy.

We have had particularly beneficial cooperation in our fast reactor and gas cooled reactor development programs and in several areas of basic nuclear research including controlled thermonuclear fusion.

ONE-YEAR EXTENSION IN 1965 OF ORIGINAL UNITED KINGDOM CIVIL AGREEMENT

As the committee will recall, our first agreement with the United Kingdom for cooperation in the civil uses of atomic energy terminated last year with the expiration of its 10-year period. At that time a 1-year extension was approved and this past year has been used for consultations with the United Kingdom as to the nature of our cooperation in the future.

These consultations have resulted in a significant new development in our cooperation which will be made possible by the new civil power applications agreement which you have before you.

PROPOSED POWER AGREEMENT WITH UNITED KINGDOM

This agreement covers the supply of up to 8,000 kilograms of U^{235} for use in the United Kingdom's civil nuclear power program during the next 10 years and provides that the International Atomic Energy Agency will be requested to assume responsibility for applying safeguards to all materials transferred under the agreement.

I am pleased that the United States and the United Kingdom are able to make this strong affirmation of our support of the International Atomic Energy Agency and its safeguards system. In this

regard I am also pleased to inform the committee that the United Kingdom signed the agreement with the IAEA on June 20, to place the 300-megawatt Bradwell nuclear power station under IAEA safeguards, effective September 1, 1966.

The United Kingdom's first nuclear power program, which includes Bradwell and eight other natural uranium fueled stations, is nearing completion and a second and larger program is being undertaken. This program is expected to consist of six stations, each with an electrical output of 1,200 megawatts or more. These stations, which will have a total output of about 8,000 megawatts, are scheduled for startup during the years 1969 through 1975.

The reactors in this program will be the first United Kingdom power reactors to use enriched uranium fuel. Thus the two principal nuclear power programs underway at the present time, those in the United States and the United Kingdom, will both depend on the use of enriched uranium.

REACTIVATION OF CAPENHURST GASEOUS DIFFUSION PLANT

The reactivation of the Capenhurst enrichment plant, which was announced by the Atomic Energy Authority in December 1965, is expected to provide the bulk of the enriched uranium for the new program, but additional quantities are expected to be required from the United States to meet the peak requirements for inventory during the construction period.

It is the purpose of this agreement to provide for the transfer of material to meet this requirement. While the exact amount of this requirement cannot be specified at this time, the United Kingdom estimates that approximately 8,000 kilograms of U^{235} will be needed. This amount of material represents, at current U.S. prices for enriched uranium, approximately $80 to $90 million, or if it were obtained wholly by toll enriching it would provide revenues of approximately $35 million.

PROVISION FOR TOLL ENRICHMENT

The agreement contains a provision for toll enrichment of United Kingdom uranium in U.S. facilities after December 31, 1968, and provides that prices for the enriched uranium sold and for services performed under the agreement will be those in effect for users in the United States at the time of delivery.

IMPLEMENTATION OF PRIVATE OWNERSHIP LEGISLATION

As in the case of other recent agreements, the private ownership legislation of 1964 is reflected by enabling private parties in the United States and the United Kingdom to be parties to arrangements for the transfer of special nuclear material.

Such arrangements will take place under regulations and licensing requirements to be established, as well as under applicable laws and policies relating to transactions by private parties. The quantity of U^{235} to be provided under this agreement will be calculated on the new adjusted net quantity basis which does not include the quantity of U^{235} contained in natural uranium.

The new agreement contains our usual statutory guarantees that no material, equipment or devices transferred pursuant to the agree-

ment will be used for other than peaceful purposes. In the event that the parties do not reach agreement on the application of IAEA safeguards, either party may terminate the agreement.

PROPOSED AMENDMENT TO CIVIL RESEARCH AGREEMENT WITH UNITED KINGDOM

In addition to the supply of material for civil power applications under the new agreement, we will continue to provide enriched uranium to the United Kingdom for civil research and development purposes under an extension of the existing agreement with the United Kingdom. The quantities of material which the United Kingdom will require under the extended agreement will continue to be approximately the same as required during the past 2 years, about 200 kilograms of U^{235} annually.

The amendment will extend the existing agreement for 10 years from July 20, 1966, and provide a total additional quantity of 2,000 kilograms of U^{235} for civil research and development purposes.

The 2,000 kilograms will be in addition to the 400-kilogram ceiling in the current agreement which was provided for by the amendment of June 29, 1964. The United Kingdom has contracted for all but 2½ kilograms of the present ceiling. The sale of this U^{235} under the existing agreement has resulted in revenues to the United States of more than $4.8 million.

The Atomic Energy Authority will continue to require 93-percent enrichment for much of its program under this agreement for fueling research, experimental and materials testing reactors.

The amended agreement will continue the statutory guarantees in the existing agreement that no material, equipment, or devices transferred pursuant to the agreement will be utilized for military purposes.

Mr. Chairman, I believe that these agreements give positive support to our longstanding tradition of cooperation with the United Kingdom in atomic energy matters and to the policies of both the United States and the United Kingdom to foster the development and widespread use of the safeguards system of the International Atomic Energy Agency.

I shall be pleased to answer whatever questions the members of the Committee may have on the amendment and the agreement.

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIAL

Senator GORE. Mr. Chairman, at the bottom of page 3 you refer to the Private Ownership Act. I don't quite understand just how this operates. Does not the Government itself process the uranium and enrich it? If so, then how does a private party become party to a transaction with Great Britain?

Dr. SEABORG. With the enactment of the Private Ownership Act of 1964,[1] it became possible for private parties to own fissionable material. That makes it possible to have transactions between private parties in the United States and the United Kingdom but subject to the regulatory procedures of the two countries.

Senator GORE. I understood at the time we passed the bill, or I thought I did, that we were making it possible for private citizens and private concerns in the United States to own uranium.

[1] Public Law 88-489, 88th Cong., 2d sess. (1964).

I did not understand that it was our intent to cut private parties in on the transfer of uranium from one government to another or from one country to another. Is this what is being done? Is there a middleman profit in this or an unnecessary take?

Mr. KRATZER. Perhaps I could respond to that question, Mr. Chairman. The private ownership legislation passed in 1964 did now authorize in addition to private ownership in the United States the export of special nuclear materials.

Senator GORE. It did not require it.

Mr. KRATZER. No, sir. This was done to cover situations where, after material has been purchased from the United States, in the form of U^{235} from our diffusion plants it is processed here in the United States to some other fuel, into fabricated fuel elements or intermediate forms or some other form at the request of a foreign user.

In this instance it might be very convenient for the fabricator of the material in the United States to purchase it and then to carry out the export transaction himself.

Senator GORE. It might be what?

Mr. KRATZER. It might be more convenient for the private party in the United States, the fabricator, to purchase the material from the Commission.

Senator GORE. It might be a readymade profit.

Mr. KRATZER. No, sir; he would be selling his fabrication services to his customer abroad. He would have bought the enriched uranium from the Commission at our public prices and of course that would be included in the material that he sells to the other party, but certainly he could not add on to that any charges for services that he did not perform by way of fabrication, processing, and handling.

Otherwise the customer abroad would be perfectly entitled by these agreements that we have, of which this is an example, to obtain the material directly from us and have it fabricated to his order either here in the United States or abroad.

Senator GORE. Are not some of these transfers U^{235}?

Mr. KRATZER. Yes, sir; and I would say in the United Kingdom case, while it is very unlikely that they will resort to these provisions which permit private transactions because it is their intention to have the material delivered to them in the form of UF–6 and perform the fabrication operation in Great Britain, we still felt it would be desirable to put the provisions in here so that in case there are any changes in their plans this could be taken advantage of.

Senator GORE. Are you saying, insofar as the transfer of U^{235} is concerned and in that form in the stockpile, that transfer will be made to Great Britain without the intervention of private ownership?

Mr. KRATZER. Yes, sir; I am quite sure that is the case. The only possibility is if they had some conversion to operations performed by some processor here in the United States which is not currently contemplated.

Senator GORE. Are you saying further that it is only in those instances in which a private concern engages in processing the materials that the private ownership will intervene between the Government of the United States and the Government of Great Britain?

Mr. KRATZER. That is the only case I can consider. That is not the requirement in the agreement, but I cannot image a customer abroad who wants only UF–6 which the Commission delivered

directly retaining a private party in the United States to purchase it for him, to take title and simply to export it.

Representative PRICE. Dr. Seaborg, you have two different proposals here in connection with the United Kingdom; is that right?

Dr. SEABORG. That is right.

TERMS OF EXTENDED AND NEW AGREEMENTS

Representative PRICE. One is an amendment to an agreement that is already in effect. How much longer does that agreement have to go on the research reactor—or rather, on the research program?

Dr. SEABORG. The agreement expires July 20 of this year.

Representative PRICE. I thought you said an amendment to that agreement?

Dr. SEABORG. Amendment or extension, I suppose.

Representative PRICE. Is this what it is, an extension of your existing agreement?

Dr. SEABORG. Yes; it is an extension in amended form of an existing agreement for a 10-year period.

Representative PRICE. Then both of them are 10-year extensions of existing agreements?

NEW POWER AGREEMENT WITH UNITED KINGDOM

Dr. SEABORG. No; the other one is a new agreement.

Representative PRICE. The one relating to the civilian reactor program—that is the new agreement?

Chairman SEABORG. Yes. Civilian power applications agreement is a new agreement for a 10-year period.

Representative PRICE. And the research program will require about 2,000 kilograms of U^{235}?

Dr. SEABORG. The research program will require over the 10-year period about 2,000 kilograms of highly enriched U^{235}.

Representative PRICE. And the civilian power program will be 8,000?

Dr. SEABORG. The civilian power application agreement will require about 8,000 kilograms of slightly enriched uranium 235 over the 10-year period.

CAPACITY OF CAPENHURST GASEOUS DIFFUSION PLANT

Representative PRICE. Don't the United Kingdom diffusion plants have the capacity to produce this enriched material?

Dr. SEABORG. The Capenhurst diffusion plant has the capacity to produce more than this amount of low enriched material but not as much as they will need in their second nuclear power program. It is not now in a shape so that it could produce the highly enriched material under the amended agreement. This section of the plant has been shut down since 1963.

EFFICIENCY OF CAPENHURST GASEOUS DIFFUSION PLANT

Representative PRICE. I understand that the Minister of Technology of the United Kingdom stated that the efficiency of the reactivated Capenhurst plant would be improved sufficiently in the

1970's to permit it to produce slightly enriched uranium at costs comparable to our own. If this should occur, would that mean that the United Kingdom would no longer look to the United States for such material?

Dr. SEABORG. It might be that they would not look to the United States for such material after the expiration of this agreement. They apparently would need the 8,000 kilograms in order to meet the requirements for their 8,000-megawatt program which is to be completed by about 1975, but if they do make the improvements that have been indicated they might not need more low enriched uranium from the United States after the completion of that program.

Representative PRICE. Thank you.

Senator GORE. Mr. Hosmer.

COMPETITION BETWEEN UNITED STATES AND UNITED KINGDOM

Representative HOSMER. Dr. Seaborg, you have reiterated the cooperative aspects of the United States-United Kingdom effort but you have not as yet delved into any of the competitive aspects. In the April issue of the U.K.A.E.A.'s magazine called Atom there was a question directed to Frank Cousins, the Minister of Technology, as to what initiatives have been taken to press the sale of British advanced gas-cooled reactors in the United States of America. Mr. Cousins replied:

> Every opportunity is taken to ensure that potential customers both in the United States of American and elsewhere are kept fully informed of the success of advanced gas-cooled reactors in the United Kingdom. For commercial reasons it would not be appropriate for me to comment at this stage on the further initiatives which are in hand or under consideration.

Could the United Kingdom take its uranium and have it enriched under this bilateral in the United States for reactors it is trying to sell in the United States?

Dr. SEABORG. I suppose that it could, yes; but the amount that is possible under this new agreement is rather limited so that it would not be sufficient——

Representative HOSMER. What limits it?

Dr. SEABORG. There is a specified limit of 8,000 kilograms.

Representative HOSMER. They can blend it with their own, can they not?

Dr. SEABORG. That will not help.

Representative HOSMER. This is 93 percent enrichment that we are talking about.

Dr. SEABORG. No, sir; this is 1½ to 2 percent enrichment, calculated on what—on the way I have indicated, that is, concentration in addition to that of natural uranium so the limits there of what they can do by blending are pretty severe. In fact, I don't see that it would be to their advantage.

TOLL-ENRICHED MATERIAL WITHIN 8,000-KILOGRAM CEILING

Representative HOSMER. Does any material that is toll enriched here comes within the 8,000-kilogram limit?

Dr. SEABORG. It comes within the 8,000-kilogram limit and I think that would be an amount that would be insufficient to provide

the initial inventory and the fuel requirements for a 20-year life for even one 1,200-megawatt reactor.

Representative HOSMER. Does that include the enrichment by private parties that you are talking about?

Dr. SEABORG. Yes. We were not talking about if there were enrichment by private parties but there is not any reasonable probability that there would be enrichment in this time period by private parties before 1975.

Representative HOSMER. Do you know what Mr. Cousins was referring to when he talked about future initiatives concerning the sale of reactors in this country or elsewhere?

Dr. SEABORG. No, I don't. I suppose he meant, though, that they would be in the market for the sale of nuclear power reactors.

Representative HOSMER. Is there any other way in addition to this bilateral by which the British could get any uranium enriched in the U.S. enrichment facilities?

Dr. SEABORG. I would not think so except by modification of the bilateral or an amendment to increase the amount.

TOLL ENRICHMENT SERVICES

Representative HOSMER. What about British reactor sales to some other country? Could a foreign country itself supply uranium concentrate for enrichment in the United States and thereafter permit the British to fabricate it and reexport it to the country buying a reactor?

Dr. SEABORG. That would be possible. That country would be limited by the amount of material that was specified as a limit in their bilateral arrangements with us.

Representative HOSMER. So that would be in addition to the 8,000 kilograms?

Dr. SEABORG. That would be in addition to the 8,000——

Representative HOSMER. If they go on another country's allocation?

Dr. SEABORG. Yes, if the United Kingdom found it possible to allocate in that manner. The indications are, however, that the United Kingdom needs this 8,000 in order to furnish the inventory and the operating requirements for the six reactors in their second nuclear power program during the lifetime of this agreement.

Representative HOSMER. Incidentally, I notice in the text of this agreement provisions which authorize blending up to 20 percent or even higher if there is a technical or economic justification.

Am I reading this correctly?

Mr. KRATZER. That is right. I don't think blending is what is involved. I think it says that the United States may supply material enriched to greater than 20 percent if there is a technical and economic justification. That is always standard language in our agreements.

Representative HOSMER. They can go up to 20 percent enrichment under this arrangement and then blend back down?

Dr. SEABORG. That does not buy them anything. You still don't get any more enriched U^{235}. In fact, that would be a waste of money because they would then be paying for separative work which was later wasted in the blending process and they would still

only come out with the total of 8,000 kilograms of enriched uranium according to our definition.

Representative HOSMER. Then you see in that no possible way in which the British reactor manufacturers could obtain a competitive advantage against the U.S. reactor manufacturers in foreign sales?

Chairman SEABORG. Not through the blending process; no, sir.

USE BY UNITED KINGDOM OF CAPENHURST PRODUCTION FOR COMPETITION WITH UNITED STATES

Representative HOSMER. Again this monthly bulletin of the United Kingdom Atomic Energy Authority—in this case the March 1966 edition—contains one of the Authority's ads that asserts that the United Kingdom Atomic Energy Authority can supply oxide fuel for any kind of experimental reactor for customers throughout the world. "Fuel can be supplied to customers requirements as natural or enriched uranium oxide, pellets" and so forth.

Here we are supplying the British with enriched uranium and they are offering to sell enriched uranium to anyone else all over the world. Are we not, in effect, substituting U.S. enriched uranium for their domestic reactors and permitting their Capenhurst production to go on the world market in competitition with U.S. exports?

Dr. SEABORG. There is the possibility of the United Kingdom using this material in that way. As I have indicated the amount of the material is so limited that the amount that they could sell in this way would not make a very great contribution to their power reactor industry.

Representative HOSMER. I notice the same United Kingdom Authority has taken a full-page ad in British Nuclear Engineering for June of 1966 to the same effect as that which I just quoted, so they must have some hopes or aspirations of an export business on nuclear reactors. As a consequence, if they are enriched——

Dr. SEABORG. I am sure that in the future they do hope to enter the world market for the sale of their AGR reactor and their light water-cooled heavy water reactor.

DEMANDS UPON DOMESTIC ENRICHMENT FACILITIES

Representative HOSMER. Dr. Seaborg, the trade publications have listed an amazing number of orders in the United States for nuclear power stations—much more than anticipated by the Commission's 1962 report to the President [1]—indicating that there will be a great drain upon our enrichment facilities simply to fill up the reactors that are going to be built in the United States.

What happens under this agreement for cooperation when and if the demand for enriched uranium in the United States reaches the capacity of our enrichment plants and at the same time you have an order from the British pursuant to this authorized 8,000 kilograms. Who gets the uranium—the British or American utilities?

Dr. SEABORG. I don't think this 8,000 kilograms——

Representative HOSMER. It would allow about 1,200 megawatts of installed capacity; would it not?

Dr. SEABORG. It will allow more than that. It will allow about 3,000 megawatts installed capacity of the initial core.

[1] See footnote 3, p. 43.

Representative HOSMER. Aren't we talking about the initial core essentially, when we are talking about the 10-year agreement?

Dr. SEABORG. Actually it will be initial core as well. You cannot differentiate actually. I believe in order to meet the requirements for their 8,000 megawatt program, which includes the initial cores and the U^{235} consumed, up until 1975, that a total many times the 8,000 kilograms will be required.

Thirty-thousand kilograms will be required, so we are contributing only about 20 percent of the total.

Representative HOSMER. What happens, Dr. Seaborg, when the capacity of our enrichment plants is used up and there has to be a decision whether the product goes into the domestic U.S. reactors or goes to the British under this agreement?

Dr. SEABORG. I don't think within this time scale, Congressman Hosmer, that is possible. We can calculate even on the basis of this increased nuclear power, the increased magnitude of nuclear power that is predicted in the United States in the 1970's that we would run out of uranium until after 1975 so that we would not have the situation that you are describing with respect to this 8,000 kilograms of enriched uranium.

CUTBACKS BY AEC IN DIFFUSION PLANTS' PRODUCTION

Representative HOSMER. Perhaps we would not have it if the commission had not cut back the production of the diffusion plants to about what our requirements are at the present time and, instead, built up a cushion of this stuff in storage.

I think three times now the Commission has cut back on our enriched uranium production, has it not?

Dr. SEABORG. Yes, but that has not led to a problem along the lines you have indicated.

Representative HOSMER. But it could then lead to it if some of these more optimistic estimates of the installation of nuclear capacity in the United States are realized.

Dr. SEABORG. It could lead to the necessity for restoring some of the electric power you see for U^{235} but that we would intend to do.

Representative HOSMER. You have stated you do not think the capacity of our diffusion plants would be used up but let's just hypothesize that it is by this domestic demand—who then gets the products, the United Kingdom or the United States users?

Dr. SEABORG. It is difficult to answer that type of hypothetical question when we know the enrichment capacity can't possibly be exceeded during the term of this agreement; that is, the potential capacity after we increase the power up to the limits that we know we can operate the plants at, at which we know we can operate the plants.

Representative HOSMER. It would be no more difficult to answer that question if you knew that that was the fact, would it?

Dr. SEABORG. I would be answering a question that there is no possibility we will ever be faced with.

Representative HOSMER. Why don't you just humor me and answer it?

Dr. SEABORG. I suppose we would honor the commitment.

Representative HOSMER. To the derogation of our own nuclear capacity, even though the British could be substituting this uranium for Capenhurst enrichment that is going to foreign sales on their part?

Dr. SEABORG. But I think you will agree it is only fair to say this—if this situation that you have mentioned were possible, then we would have taken that into account in our considerations.

Representative HOSMER. I am a little bit bothered by the whole train of events here, because we know of our great Yankee traders and their shrewdness, and I suppose they learned everything they knew from the British, and they did not learn all that the British knew.

SOLICITATION BY UNITED KINGDOM CENTRAL ELECTRICITY GENERATING BOARD OF AMERICAN BIDS ON DUNGENESS B ATOMIC POWER STATION

We had the experience last year of the British white paper in which they enticed American firms into making bids in competition with United Kingdom firms. Then officially, through their atomic agency, came out and gave Government blessing to a report which indicated that the British reactors were a lot better than the American reactors, when in fact and in truth a number of questionable assumptions and allocations of charges were made in order to come to that conclusion.

Dr. SEABORG. We will have firm contracts, both with our foreign customers through these agreements for cooperation and with our domestic reactor operators which we will always be in a position to honor.

If we reach the point where it appears that within a few years, which we will reach in the late 1970's by the way, the point where there is not sufficient enrichment capacity, then we will arrange one way or the other to have constructed perhaps through private enterprise, at that time the additional enrichment capacity that would be required.

In the meantime, however ——

AVAILABILITY OF SPECIAL NUCLEAR MATERIAL FOR DOMESTIC AND FOREIGN DISTRIBUTION

Representative HOSMER. In the meantime, do you have any estimation of the total amount of enriched uranium that will be involved in all of these bilaterals or other agreements for the sale of enriched uranium by the United States so that we know what the total draw is, including the 8,000 for the United Kingdom?

Dr. SEABORG. We were working under the Presidential allocation of 150,000 kilograms of enriched uraniun for foreign use.

Representative HOSMER. Over what period?

Dr. SEABORG. That is just the ceiling.

Representative PRICE. Is all of that committed?

Dr. SEABORG. It is apparently fairly close to that ceiling.

Mr. CONWAY. It has been raised from 150,000 to 250,000 kilograms for foreign distribution.

Dr. SEABORG. That is right.

Mr. CONWAY. Domestically it is up to a total of 300,000 kilograms.

Dr. SEABORG. You are absolutely right.

(Relative to the subject discussed immediately above, there are reproduced below an announcement by the President and a statement

by AEC Chairman Seaborg released by the White House at a news briefing on Wednesday, Feb. 2, 1966:)

ANNOUNCEMENT BY THE PRESIDENT

In accordance with the Atomic Energy Act of 1954, the President determines the quantities of special nuclear material to be made available for distribution at home and abroad. Such a Presidential determination of quantities of enriched uranium for peaceful uses was announced on July 3, 1963. Since that time, there has been considerable progress in plans for the increased utilization of enriched uranium in nuclear power plants. In order to give assurances that enriched uranium can be supplied to meet these needs, I am announcing today a further increase in the quantities of material to be made available.

I have determined, pursuant to section 41b of the Atomic Energy Act of 1954, as amended, that the quantities of uranium-235 in enriched uranium to be made available are raised from 200,000 to 300,000 kilograms for domestic distribution under section 53 and from 150,000 to 250,000 kilograms for foreign distribution under section 54. These amounts have been recommended by the Atomic Energy Commission with the concurrence of the Secretaries of State and Defense. The new total of 550,000 kilograms is more than 50% higher than the previous total.

The material will be distributed as required over a period of years and will be subject to prudent safeguards against unauthorized use. Charges for this material will result in substantial revenue to the U.S. Government. As nuclear programs develop in the future, it will undoubtedly be necessary to make further determinations increasing the amounts of material to be available. The large capacity of U.S. diffusion plants for the production of enriched uranium permits them to meet both civilian and military requirements.

A discussion of the new determination is contained in the attached statement by the Chairman of the Atomic Energy Commission.

STATEMENT BY GLENN T. SEABORG, CHAIRMAN U.S. ATOMIC ENERGY COMMISSION

The President's announcement today that the quantities of enriched uranium to be made available for peaceful uses at home and abroad have been increased to a total of 550,000 kilograms of contained U–235 is another important step forward in the civilian applications of atomic energy. Of this total, 300,000 kilograms is for distribution to licensed users within the United States and 250,000 kilograms is for distribution to foreign countries under civil agreements for cooperation.

The material will be used in research and development and as fuel in nuclear reactors, with the bulk of it being utilized in generating electricity. Most of the material will be of low enrichments.

The new determination by the President is expected to cover allocations of material under present domestic licenses and foreign agreements for cooperation and those anticipated in the near future, whether distribution is to be by sale, lease, toll enrichment, or other arrangements. (Toll enrichment services may be provided by the AEC only after December 31, 1968, but contracts for such services may be entered into before that date.) The current schedule of base charges for enriched uranium was announced by the AEC on May 29, 1962. Material for use in the AEC's own facilities is not included in this determination.

Allocation of enriched uranium to a reactor project includes material for the fuel loading, for fuel consumption over the period of the domestic license or foreign agreement for cooperation, and for the inventory outside of the reactor associated with the manufacture and storage of fuel elements, cooling and shipment of irradiated fuel, and chemical processing of irradiated fuel to recover the remaining uranium and plutonium. The amount of U–235 contained in enriched uranium returned to the AEC is deducted from the amount supplied by the AEC in computing how much is available for further distribution. The material allocated to a reactor project may not be completely distributed for several decades.

As of December 31, 1965, there were in effect in the United States construction permits or operating licenses for 18 power reactors, 5 test reactors, 75 research reactors, and 17 critical-experiment facilities, and 583 licenses for other uses of special nuclear material, not including the AEC's own reactors, facilities, and uses. Agreements for cooperation in the civil uses of atomic energy are in effect between the United States and a large part of the free world, including 34 countries and

West Berlin; 16 of these agreements provide for cooperation on power reactors. In addition, agreements are in effect with the International Atomic Energy Agency and the European Atomic Energy Community (Euratom).

Enriched uranium for peaceful uses is distributed abroad only under civil agreements for cooperation. All such agreements contain a guaranty by the cooperating country that the material supplied will be used exclusively for peaceful purposes. Safeguard provisions allowing inspection of materials, facilities, and records by U.S. or international inspectors are also included, as appropriate.

Representative HOSMER. This is all within the capacity of your diffusion plants within this 10-year period?

Dr. SEABORG. Yes, that is the increased capacity.

Representative HOSMER. By capacity I mean that which you can turn on. I am not talking about what you can build.

Dr. SEABORG. That is what I mean by capacity, that which we can turn on in order to get back up to the level of operations that we had just a few years ago in our gaseous diffusion plant complex.

Representative HOSMER. You may not be able to answer this for security reasons but over what period of time are you thinking about for producing these 550,000 kilograms?

Dr. SEABORG. It is not so much a security question as it is a complex question. Some of this material relates to the life of the reactor, some of it relates to a 10-year period as in this case, and of course the domestic 300,000 kilograms——

Representative HOSMER. You really do not have any substantial amount coming back out of reactors until roughly the end of the 10-year period.

Dr. SEABORG. There will be reenrichment although in the case of the British uranium, I don't believe that reenrichment is of any great economical advantage at least in the——

Representative HOSMER. Most of the 250,000 kilograms you are going to export will not come back?

Dr. SEABORG. Some of it may come back for toll enriching.

Representative HOSMER. But it would not be part of this 500,000 that is committed and it would be a load on your plants?

Dr. SEABORG. If it comes back it is of no particular help. You are just replacing——

Representative HOSMER. I was hoping and I would ask un amous consent that there might be submitted for the record some sort of reasonable calculations along the lines of my questioning.

I know that you do not have it at your fingertips but it seems to me that this is information that must be had if we are to be assured that these arrangements do not add up to something improvident.

Dr. SEABORG. I think perhaps your questioning would relate more to the raw materials picture. I do not have any concern about the enriching capacity. I think we will always be able to build the enriching capacity, but I think your question with respect to it——

Representative HOSMER. I suppose the raw material angle from the foreign sales is taken care of by the fact that they can supply the raw materials.

ASSESSMENT OF URANIUM AVAILABILITY AND REQUIREMENTS

Dr. SEABORG. Yes, but in the present instance we are furnishing the 8,000 kilograms through the use of our own raw materials. So I would see greater relevancy in your question if it were pointed to

the raw materials question and our future capability to meet the domestic requirements as well as the foreign requirements.

We have given this a good deal of thought and this, of course, relates to our present resources of uranium.

Representative HOSMER. There is some doubt about that.

Dr. SEABORG. The projected resources of uranium and our program of building advanced converter reactors that use the raw materials more efficiently.

As I say, we have given a good deal of thought to that question and we would be glad to try to give you a summary picture of how we look at the future over the next decade or two in that respect.

Representative HOSMER. I don't want to overburden the Commission but if you could get us something reasonable along that line I would appreciate it.

Dr. SEABORG. This is something that we have been giving so much attention to we can do this without undue burden.

(The information referred to follows:)

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 1, 1966.

Hon. ALBERT GORE,
Chairman, Subcommittee on Agreements for Cooperation,
Joint Committee on Atomic Energy,
Congress of the United States.

DEAR SENATOR GORE:

At the June 28, 1966, hearing on Agreements for Cooperation I offered to summarize for the Committee our assessment of uranium availability and requirements over the next decade or so.

I am pleased to supply herewith a staff review of the relationship between requirements and supplies. We see no reason to be pessimistic about the availability of uranium to meet the growing nuclear requirements. In addition, we expect that improved uranium utilization through more advanced reactors will not only reduce the amount of uranium needed to generate a unit of electricity, but it will also make it possible to use economically higher cost uranium, thereby increasing the quantity of uranium available.

If further information is desired, please let me know.

Cordially,

GLENN T. SEABORG, *Chairman.*

A COMPARISON OF PROJECTED U_3O_8 REQUIREMENTS AND RESERVES

Two charts are attached which show graphically the relationship between current estimates of uranium reserves and projected U_3O_8 requirements.

Figure 1 shows our estimate of reasonably assured domestic uranium reserves in relation to currently projected cumulative uranium requirements for domestic nuclear power through 1980. The estimates assume that most of the nuclear capacity installed during this period will be light water reactors and the remainder advanced converters; fast breeders are expected to have no appreciable effect on requirements during this period.

The reasonably assured reserves at $10 per pound U_3O_8 shown in Figure 1 are as of January 1, 1966. The estimate has not been adjusted to reflect either the Commission's scheduled purchases of 42,000 tons of U_3O_8 during calendar years 1966–1970 or the additions to reserves which are expected to result from exploration and mine development during the same period. The additions should amount to at least a significant part of the quantity purchased and could equal or exceed deliveries. Moreover, the Commission has indicated that it will have a substantial inventory in excess of its needs by 1970. As indicated in previous testimony before the Committee, this surplus will be made available for commercial use in a manner which will not disrupt the prevailing market and will be in the national interest.

Figure 2 shows the relationship between ore reserves and projected requirements for the non-Communist world, including the United States. Because uranium can be transported cheaply from its origin to point of use it will be traded on a

world-wide basis. Nations, like Canada and South Africa, for example, which have large reserves in excess of their projected requirements, would like to sell some of their uranium to meet nuclear fuel requirements in other countries.

These charts indicate that reasonably assured domestic reserves up to $10 a pound are about equal to our requirements through 1980, while those of the non-Communist world as a whole substantially exceed world requirements through 1980. Of course, an increasing exploration effort will be needed to maintain a satisfactory operating reserve. There is no question that such exploration will result in substantial additions to low-cost reserves during the period under consideration. However, in testimony to the Joint Committee and in public statements we have expressed the view that exploration should be started by industry at an early date because of the long lead time required from the beginning of exploration to the start of commercial production operations from newly discovered deposits.

Reasonably assured reserves should be regarded as in the nature of a working inventory about which sufficient information has been collected to provide confidence that the tonnages exist and can be produced at the prices shown. They are not an indication of total resources. Even estimates of possible additional resources, which represent informed judgments based on geologic and other data, are not intended to represent all that will be found. They are regarded as conservative inasmuch as they are based only on expectations of new discoveries in the western United States in those areas in which geologic conditions are known to be favorable for uranium deposition. No weight has been given to large areas of the country in which significant deposits have not yet been found, for example, the entire United States east of the Mississippi River. Tabulations including these estimates of additional resources at several cost levels are also enclosed.

Few mineral commodities have, or have had in the past, established reserves sufficient to provide many decades of production at current rates of consumption. For example, during the 30-year period 1935–1965, crude petroleum reserves have ranged from 10 to 14 times the current annual production. On the basis of forward requirements, reserves during this period would have been sufficient for only 9 to 11 years' supply. Continuous exploration and discovery have succeeded in maintaining a relatively consistent reserve-requirement ratio over the years. The same phenomenon is common to many other mineral commodities; the ratio differs for different commodities and is determined by a combination of technological and economic factors.

Some reduction in the amount of uranium required to generate a given quantity of electricity seems certain with the development of advanced converters which use uranium more efficiently. These reactors require less uranium, and, therefore, are expected to be able to use higher cost uranium economically. Through increases in specific power, higher burnups, and other engineering improvements furture generations of light water reactors also will be more efficient in their uranium utilization. Moreover, in the near future, we look forward to reductions in reactor fuel fabrication and reprocessing costs. Advances in this area should make it possible for the utilities to pay substantially higher prices for uranium to fuel the present generation of reators without increasing the fuel cycle cost.

In the long run, the Commission's program of developing high gain breeder reactors, which is being vigorously pursued, has been undertaken in recognition of the fact that only by the use of breeders would we really solve the problem of adequate energy supply for future generations.

FIGURE 1

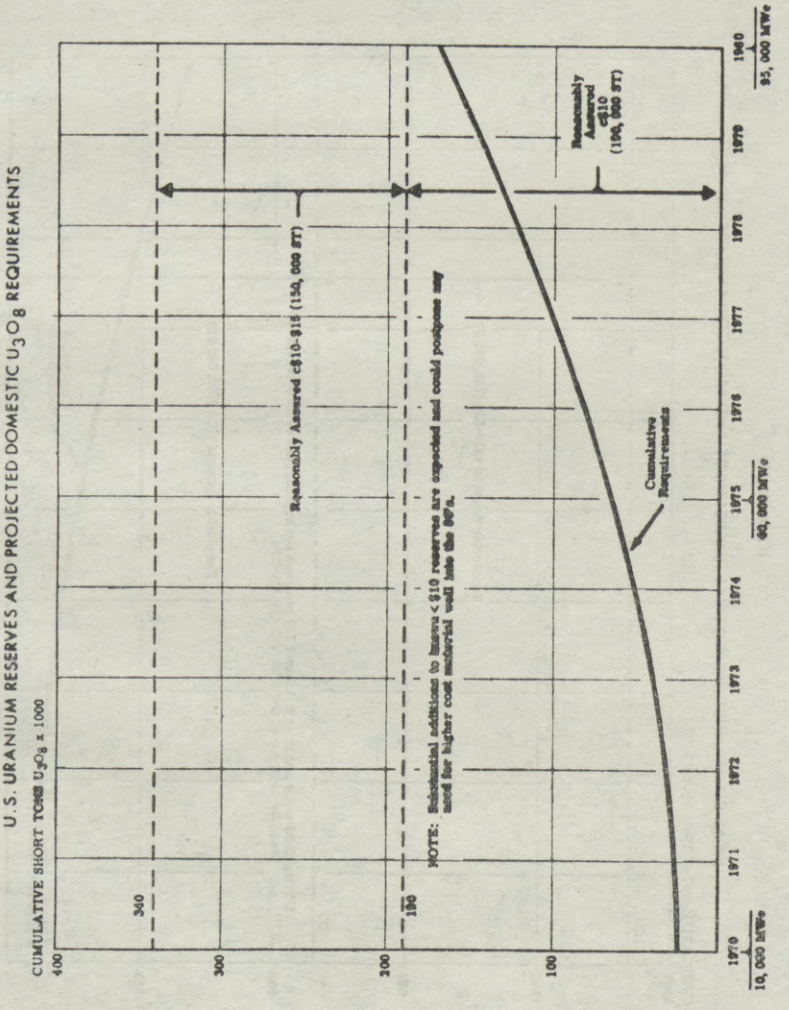
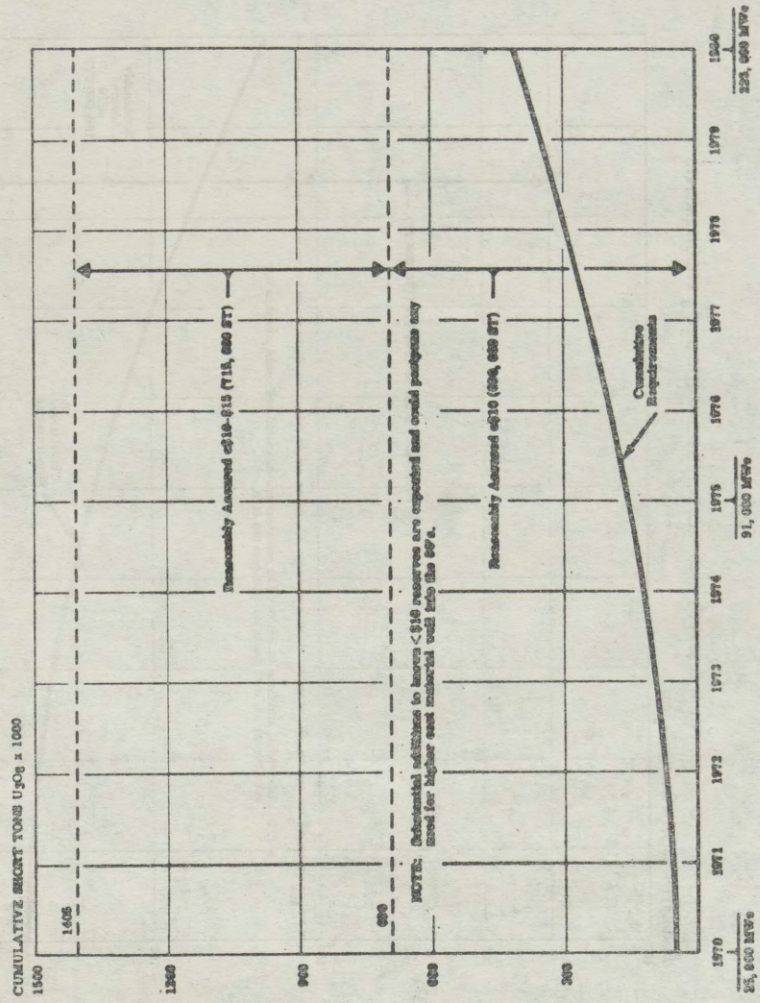

July 1966
U.S. URANIUM RESERVES AND PROJECTED DOMESTIC U_3O_8 REQUIREMENTS
CUMULATIVE SHORT TONS U_3O_8 x 1000
400
300
200
100
340
150
Reasonably Assured $10-$15 (150, 000 ST)
NOTE: Substantial additions to known <$10 reserves are expected and could postpone any need for higher cost material until into the 80's.
Reasonably Assured <$10 (100, 000 ST)
Cumulative Requirements
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
10,000 MWe
40,000 MWe
85,000 MWe

FIGURE 2


NON-COMMUNIST WORLD URANIUM RESERVES AND PROJECTED REQUIREMENTS
July 1966
CUMULATIVE SHORT TONS U_3O_8 x 1000
1500
1200
900
600
300
1405
600
Reasonably Assured e$10-$15 (715, 000 ST)
Reasonably Assured e$10 (600, 000 ST)
Cumulative Requirements
NOTE: Substantial additions to known <$10 reserves are expected and could postpone any need for higher cost material until into the 80's.
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
25,000 MWe
50,000 MWe
75,000 MWe
100,000 MWe

U.S. uranium resources

[In tons U_3O_8×1,000]

Price per pound U_3O_8	$8	$8–$10	$10–$15	$15–$30	Total
Reasonably assured	145	45	150	170	510

Price per pound U_3O_8	$10	$10–$15	$15–$30	Total
Possible additional [1]	325	200	440	965

World uranium resources [2]

[In tons U_3O_8×1,000]

Price per pound U_3O_8	$10	$10–$15	$15–$30	Total
Reasonably assured	690	715	570	1,975
Possible additional [1]	680	500	1,100	2,280

[1] The figures for possible additional resources refer to geologic estimates of future discoveries for those regions in which important efforts have been made in the field of prospecting or evaluation.
[2] Including United States, but excluding U.S.S.R., China, and Eastern Europe.

World reserves and resources of uranium

[In thousands of short tons U_3O_8]

	$5–$10/lb.		$10–$15/lb.		$15–$30/lb.	
	Reasonably assured	Possible additional	Reasonably assured	Possible additional	Reasonably assured	Possible additional
Canada	210	290	130	170	100	200
South Africa	190		35		40	
Sweden			350	50	150	200
Spain						250
Brazil					100	
France	35	30	5	10		
Other	65	35	45	70	10	10
Total	500	355	565	300	400	660
U.S.	[1] 190	325	[2] 150	200	[3] 170	[4] 440
Total	690	680	715	500	570	1,100

[1] 20,000 in phosphate deposits.
[2] 50,000 in phosphate deposits.
[3] 70,000 in phosphate deposits.
[4] 300,000 in phosphate deposits.

Chairman HOLIFIELD. In your opinion, then, Dr. Seaborg, the agreements to export this amount of material will not run us short of the material which will be needed for the reactors that have been announced and—taking into consideration the rapid trend of annoucements—those that are liable to be announced within our own country in the next few years?

Dr. SEABORG. No; it will not affect our ability to take care of those reactors.

NO COMMITMENT TO UNITED KINGDOM OUTSIDE OF PRESENT AGREEMENT

Chairman HOLIFIELD. Is it thoroughly understood by the British that this agreement in no way commits the United States to agree to the transfer of more nuclear fuel when this agreement expires?

Dr. SEABORG. Yes; it is understood.

Chairman HOLIFIELD. In other words, if they sell these reactors which require a 30-year supply we are not ipso facto committing ourselves to supply them for 30 years. This is a one shot deal unless we decide it is in our national interest to go ahead.

Dr. SEABORG. That is right, that is understood.

COOPERATION WITH UNITED KINGDOM IN NUCLEAR PROPULSION OF MERCHANT VESSELS

Chairman HOLIFIELD. Article 1 of the proposed civil power agreement indicates that cooperation between the United States and the United Kingdom can involve atomic energy for merchant marine propulsion. Do you have any specific cooperation in mind? My question is based on an October 6, 1965, statement made by Sir William Penney, Chairman of the United Kingdom Atomic Energy Authority, on the subject of maritime reactors. I will quote it:

> Consider for a moment nuclear marine propulsion. The Government has decided that we should not embark on a ship project or a land prototype, because at present no reactor system gives enough economic promise. The Authority is in complete agreement with this assessment. Perhaps in time a more promising concept will emerge, either in this country or somewhere else. This will probably happen but I would not like to speculate when.

In light of this negative statement on maritime reactors, why are maritime reactors included in the bilateral agreement before us?

Dr. SEABORG. We do not have in mind any specific cooperation in maritime propulsion. I believe that this language was written in such a way as to include a possible program of nuclear marine propulsion in order to avoid the ambiguity which sometimes arises as to whether nuclear power includes nuclear marine propulsion.

Senator GORE. Mr. Anderson?

SAFEGUARDS INSPECTIONS BY IAEA

Representative ANDERSON. Is the agreement involving 2,000 kilograms of highly enriched uranium covered by the same inspection provisions so far as the IAEA is concerned as the agreement involving 8,000 kilograms?

Mr. POLLACK. No, sir; it is covered by the guarantees clause that this will not be used for military purposes.

Representative ANDERSON. Is then this the manner in which you expand or resolve the question for a 10-year extension, the Missouri Compromise in other words?

Mr. POLLACK. Yes, sir.

SOLICITATION OF PRIVATE INDUSTRY'S VIEWS ON INTERNATIONAL ATOMIC PROGRAM

Representative ANDERSON. Before you negotiate and consummate this kind of agreement do you specifically go out and inquire of private industry as to how much value they derive from this type of exchange of information, or is this a judgment that you make or that the State Department or who ever negotiates these things makes without specifically consulting these sources?

Dr. SEABORG. We don't go out in the case of any particular agreement and specifically consult with industry but we do obtain the views of industry with respect to the general philosophy and our general policy with respect to such foreign cooperative programs.

We have consulted with and obtained the views, for example, of the Atomic Industrial Forum and they have created a committee on international cooperation in the Atomic Industrial Forum and we have met with that committee. I think I can say that that group which represents, I believe, the nuclear industry pretty generally is in agreement with our policy and philosophy. In fact, they made a statement along those lines some time ago indicating such agreement.

EXCHANGE OF INFORMATION WITH UNITED KINGDOM

Representative ANDERSON. I don't remember the specific details but I remember in times past when we have had hearings we have had questions come up about the unwillingness of the British to divulge certain cost details.

Do you think this agreement represents any advance in solving that problem and making sure this is more of a two-way street?

Dr. SEABORG. No, this does not address itself to that. We have agreement for cooperation in the field of fast reactors and gas cooled reactors, for example. In these fields we have a general exchange of information and exchange of visits of scientists and engineers, but this exchange of information does not go as far as certain commercial information.

This is due to the way in which this is handled in the United Kingdom which is different from the way we handle it in the United States.

They have a more direct governmental involvement there and have some restrictions on the information.

Representative ANDERSON. They have additional—they have nationalized power industry, of course.

Dr. SEABORG. Yes.

So there are some limitations on the exchange of that kind of information that we are very cognizant of, that we have very much in mind when we negotiate these exchange agreements and attempt to obtain sort of a quid pro quo bearing that restriction in mind and believe that in the case of the agreements we have negotiated that we have come out with arrangements that are more or less equally beneficial to both countries.

Representative ANDERSON. Thank you, Mr. Chairman.

Senator GORE. Mr. Pollack, do you have a statement?

STATEMENT OF HERMAN POLLACK, ACTING DIRECTOR, OFFICE OF INTERNATIONAL SCIENTIFIC AFFAIRS, DEPARTMENT OF STATE

Mr. POLLACK. Yes, Mr. Chairman.

I consider it a privilege to have the opportunity to appear before the Joint Committee to represent the Department of State in support of the agreements which now lie before your Committee.

These agreements, which were signed in the Department of State on June 2, 1966, provide for the continuation and extension of the areas of peaceful nuclear cooperation between the United States and one of our great traditional allies. They represent a significant extension of the cooperation between our own country and other nations of the world in achieving the benefits of the peaceful application of nuclear energy.

As the committee is aware, the agreements now being discussed include a 10-year extension of the existing agreement for cooperation in research and development work involving 200 kilograms of highly enriched uranium each year and a new 10-year agreement for the sale of up to 8,000 kilograms of enriched uranium for use in the United Kingdom for construction of a number of nuclear-powered electrical generating stations.

The material will all be used within the United Kingdom and under the firm guarantee that none of it may be ever used for military purposes.

TRANSFER OF SAFEGUARDS RESPONSIBILITIES TO IAEA

One very important aspect of the power cooperation agreement is the provision whereby the International Atomic Energy Agency will be asked to assume safeguards responsibilities for the 8,000 kilograms of enriched uranium which the new agreement authorizes for sale to the United Kingdom for its expanded civilian nuclear power program.

This is consistent with the policies of this Government in fostering the extension of international safeguards on a broad scale throughout the world.

In this connection, Mr. Chairman, I should like to record the Department's full recognition and appreciation of the key role which this committee has exercised through the years in constant support of, and significant leadership in, the development and more extensive application of the international safeguards principle.

The constructive influences of this committee have consistently been exercised in the interest of strengthening our national policy on safeguards.

I can assure you that the Secretary of State has personally reviewed the content of these agreements and has concluded that the foreign policy interests of the United States are well served by the provisions concerning IAEA safeguards on this transaction.

The Department feels that this represents a constructive extension of the policies which both the United Kingdom and the United States Governments have publicly adopted toward the international safeguard program by their voluntary submission of important power reactors to the safeguards system of the International Atomic Energy Agency.

In summary then, Mr. Chairman, I can state the views of the Department of State on these agreements in the following terms:

1. We support the extension of the cooperative research and development program for another 10 years under the amendment to the 1955 agreements. The terms of this amendment are satisfactory to the Department of State from a foreign policy standpoint.

2. We endorse the terms of the new agreement whereby enriched uranium from the United States will be made available for sale to the United Kingdom for use in the United Kingdom civil power program within the next 10 years.

3. We favor the arrangements whereby the International Atomic Energy Agency will be asked to assume responsibility for safeguarding the uranium purchased from the United States for the civil power program of the United Kingdom. This conforms to and reinforces the strong policy commitment which is shared by this committee, the Atomic Energy Commission, and the Department of State in our common support of the international nuclear safeguards program.

Thank you, Mr. Chairman.

SAFEGUARDS ON CHEMICAL SEPARATION AND GASEOUS DIFFUSION FACILITIES

Chairman HOLIFIELD. Mr. Chairman, I would like to say I am very pleased that the United Kingdom has joined the United States in supporting the IAEA safeguards system and that the United Kingdom has agreed to the application of IAEA safeguards to the Bradwell reactor and to the other reactors which this material will fuel in the future.

I think it is a step forward in our very important goal of putting all reactors under international safeguards, and I look forward to the time when we can have such safeguards not only on reactors but on chemical separation facilities and gaseous diffusion facilities as well.

Senator GORE. Mr. Hosmer?

APPLICATION OF INTERNATIONAL SAFEGUARDS TO NUCLEAR FUELS EXPORTED BY UNITED KINGDOM

Representative HOSMER. Have the British established any requirements regarding the application of IAEA safeguards to the material they export out of their Capenhurst production?

Mr. POLLACK. Are you asking now if we now have?

Representative HOSMER. I am asking if they have agreed to put their own exported production under IAEA safeguards.

Mr. POLLACK. I believe they have. This determination on the part of the United Kingdom is not incorporated in an agreement.

Representative HOSMER. Did they make an announcement or how did this all come about? I had not heard of it.

Mr. POLLACK. This has been a consequence—the British support of the international IAEA safeguards program has been consistent and strong——

Representative HOSMER. Just a moment. It has not been consistent. They were bucking this thing at Geneva last year. I then asked some of the Russian delegation to help us to get the British to come along with us. The Russians almost dropped dead when I

made the request so I don't think it has been a consistent policy whatsoever.

Dr. SEABORG. They have placed two of ther bilaterals in trilateral form putting the safeguards under the IAEA and I believe those are their bilaterals with Denmark and with Japan.

Mr. POLLACK. That is right.

Dr. SEABORG. They are trying to move in that direction just as the United States has been so successfully moving in that direction.

UNITED KINGDOM POLICY CONCERNING IAEA SAFEGUARDS ON REACTORS SOLD ABROAD

Representative HOSMER. Last year was not one of the British selling points to foreign purchasers that, unlike the Americans, they were not requiring their exported reactors to be under IAEA inspection?

Dr. SEABORG. I do not believe so. I think that is exaggerated.

Representative HOSMER. Mr. Pollack, could you furnish us with this information, which you do not at the moment seem to have, relative to any United Kingdom policy covering the universal application of IAEA safeguards to its exported reactors?

Mr. POLLACK. We will be very glad to supply that.[1]

USE BY UNITED KINGDOM OF CAPENHURST PRODUCTION FOR COMPETITION WITH UNITED STATES

Representative HOSMER. Is it not a fact that the 8,000 kilograms will only get the British over the hump for their domestic needs until they can get Capenhurst production up, and allowing them meanwhile to use its production for their export business. Aren't we covering over a very difficult period competitively for these foreign sales by this agreement before us?

Mr. POLLACK. I think it is clear without this agreement they would not be able to mount their nuclear power program.

Representative HOSMER. At the same time and carry on any kind of an export program.

Mr. POLLACK. My understanding is, sir, that the amounts involved here are not of sufficient magnitude to have any significant impact on their export capability during the life of this agreement.

Representative HOSMER. It seems to me if they need only a meager amount that Capenhurst ought to be able to turn it out. Are they trying to help us out in our balance-of-payments program?

Mr. POLLACK. I do not believe that is their motivation.

Representative HOSMER. I do not believe so either.

Mr. POLLACK. It is my understanding that the Capenhurst capability together with this would be largely required for the civilian power program of the United Kingdom, that it is not so much in terms of alternatives but in terms of the necessity for both.

Representative HOSMER. I don't want to give you the impression that I don't like the British, but I do know you have to watch them like a hawk when it comes down to these trading matters. I am not completely satisfied although you and Dr. Seaborg seem to be that you have cinched up all of the lines on this matter of whether or not they get an advantage.

[1] Under date of July 11, 1966, Douglas MacArthur II, Assistant Secretary of State for Congressional Relations, Department of State, forwarded a classified letter to the Joint Committee furnishing the requested information.

I feel that we are helping them over a rough period and I wonder what, if any, quid pro quo we are getting in exchange other than the application of IAEA safeguards.

REASON FOR U.S. PROVISION OF NUCLEAR FUELS ABROAD

Mr. POLLACK. You are not only obtaining the application of IAEA safeguards which is a very significant step forward but you are also lending credence to the thesis that we have attempted to put forward in our international atomic energy dealing that you can rely upon the United States as a steady, constant, and dependable source of supply for both the fuel and services required for peaceful applications of atomic energy especially for power purposes.

That, sir, is——

Dr. SEABORG. The source that supplies the material on a nondiscriminatory basis. That is what we are trying to establish, that we are not trying to bargain internationally in each case individually to find deals that have something that is only to our advantage.

The net result of that would be that we would establish an atmosphere where the countries that might use our nuclear power reactors would not have the confidence in our steady source of supply that we think is necessary.

Representative HOSMER. If this agreement were before us with some country other than Britain, with whom we have had a traditionally close relationship. I think the argument would be more compelling. I take it that this demonstrates that we are good guys and we can keep on wearing our white hats?

Dr. SEABORG. We do not feel like we are being misled. We think we understand what we are getting into here and that it is to our advantage and that it is consistent with our foreign trade policy and it is consistent with the policy that we built up over the years with respect to our dealings with the foreign market for the sale of nuclear power reactors and to supply the fuel for them.

Representative HOSMER. That goes back to two or three or four administrations ago.

Dr. SEABORG. That started with the Eisenhower administration.

(Subsequently, at the request of the committee, the Commission furnished the following statement concerning this matter:)

CONSIDERATIONS WHICH HAVE SHAPED U.S. POLICY TOWARD THE DISTRIBUTION OF URANIUM ABROAD

The conclusion that the use of U.S. enriched uranium abroad is in our interest is based on a number of considerations and has been a central feature of U.S. policy since passage of the 1954 Act. Among the important reasons for this conclusion are (1) U.S. cooperation in peaceful uses of atomic energy, of which the supply of materials on reasonable terms is perhaps the most important ingredient, is highly effective in promoting the U.S. image abroad as the world leader in this important branch of technology, and in securing a more favorable climate for U.S. activities in the atomic energy field; (2) by supplying enriched uranium under controls, we can insure that the activities involved are undertaken exclusively for peaceful purposes under effective safeguards; (3) arrangements enabling other nations to produce a substantial portion of their vital energy requirements create valuable economic and political relationships; (4) the supply of U.S. enriched uranium can result in substantial foreign exchange revenues from the sale of the enriched uranium itself, whether produced by the Government as at present or privately as may occur in the future; and (5) the availability of enriched uranium to fuel reactors abroad enhances the acceptability of enriched uranium reactors to the benefit of U.S. industry.

It is important to emphasize that the distribution of U.S. enriched uranium abroad provides an excellent means of encouraging the acceptance of international safeguards. This has been convincingly demonstrated in the negotiation of the Civil Power Agreement with the United Kingdom, as well as in several other recent Agreements for Cooperation. The negotiation of these safeguards and inspection rights and their active implementation have represented a unique and unprecedented development in international relations which is of utmost importance to the promotion of our own and world security.

Although the promotion of international safeguards and the establishment of good economic and political relationships with cooperating countries are highly important results of our policy, we do not overlook the importance of the revenues which the United States will receive as a result of supplying enriched uranium abroad. It has been estimated by the Treasury Department that U.S. sales of enriched uranium abroad may total several billions of dollars by 1980. These sales will be supplemented, of course, by the private sale of reactors and related fuel cycle services.

In recognition of the desirability of encouraging the use of enriched uranium abroad and of the problem of overcoming foreign reluctance to depend on the United States alone as a source of supply, the AEC has continually reviewed its policies in the fuel distribution area and has made numerous policy statements designed to encourage reliance on the United States as a source of supply. These policy statements, which had their origin as early as 1956 in a Presidential announcement, have consisted primarily of two principles: first, the principle of providing long-term assurances of availability, and second, the principle of offering our materials abroad to the fullest possible extent at the same charges and under the same terms and conditions as they are supplied domestically.

In implementation of these basic principles, the Commission undertook in 1961 a broad review of its foreign fuel supply policies. This review took place in parallel with a study of the same matter undertaken by the Atomic Industrial Forum. The Commission's review culminated with a speech delivered by former Commissioner Wilson in Tokyo in December 1961 which was designed to restate and elaborate on U.S. fuel distribution policies. The parallel study by the Atomic Industrial Forum was completed in October 1961 and reached a similar conclusion. In this study, which was undertaken by a Forum committee with representation from all branches of the United States nuclear industry and approved by the Executive Committee of the Forum, the conclusion was reached that ". . . enriched fuels should be made available for all civilian reactor projects in friendly countries abroad, whether or not they are of U.S. design or origin. It is felt that over the long run, this will have the effect of encouraging construction of enriched type reactors abroad, to the mutual benefit of U.S. and foreign industry."

The determination to make the supply of U.S. enriched uranium abroad free of commercial restraints is also consistent with long-standing United States policy in the field of foreign trade and with provisions of the General Agreement on Tariffs and Trade (GATT) to which the United States is a party. Article XI of the GATT agreement states that, with certain exceptions covering national security and other overriding matters, no prohibition or restrictions other than duties, taxes and other charges shall be applied to the export or sale for export of any product destined for the territory of any other party to the agreement. A note in Annex I of the agreement makes the provision of Article XI applicable to export restrictions applied by a state trading enterprise. This provision reflects the desirable policy that a government, when entering directly into foreign trade, as when regulating such trade by private persons, would be precluded from the imposition of restrictions on the exportation of raw materials for use in certain manufacturing activity abroad because such activity is competitive with that in the country of origin of the raw material.

As a major manufacturing and trading nation, which depends on imports for some of its most vital industries, the United States is unlikely to benefit from any trade war among countries involving the application of such restrictions.

The central problem in encouraging the use of United States enriched uranium abroad has long been recognized as one of assuring potential foreign users that they can rely on long-term availability of the material from the United States under stable and reasonable terms and conditions. There is a natural reluctance on the part of any nation to commit a major portion of its vital electric power generation to a sole foreign source of fuel. Therefore, despite the superiority of U.S. enriched uranium reactors, which has been increasingly recognized with the passage of time, encouragement of their use abroad is still required.

It is considered desirable, therefore, that the United States make clear that U.S. material will be provided, whenever possible, under the same conditions as it is supplied domestically, and that supply not be contingent on the use of U.S. manufactured equipment or U.S. services. This elimination of conditions of an essentially commercial nature on the use of U.S. enriched uranium helps create confidence that the supply of U.S. enriched uranium will not be affected by various political or economic pressures in the United States.

Although the sales of enriched uranium and the provision of enrichment services by the United States for nuclear power purposes to other countries and international organizations may to some degree enhance the competitive position of other countries, the AEC has considered that the long range interests of the United States are best served by making such materials and services available. Under our Agreements for Cooperation for nuclear power programs, the reactors to be constructed by the other party and fueled with U.S. material are identified either specifically or, as in the case of the U.K., as reactors in the other country's domestic program. The material supplied by the U.S. cannot, therefore, be committed to fuel a reactor exported by the other party. The supplied material might, however, replace enriched uranium, or natural uranium which might have been used for toll-enrichment services, which the other party might possess and which could thus be committed to the fueling of power reactors sold in competition with U.S. reactors. At the present time, the U.K. is the only source other than the U.S. of enriched uranium. The agreement which will provide up to 8,000 kgs to the U.K. for its civil power program will not, in our judgment, provide any significant competitive assistance to the U.K. through replacement of material for commercial sales. This conclusion arises both from the limited quantity provided and the ten-year agreement term, neither of which are sufficient to provide fuel assurances for the life-time of reactors sold as has been necessary in our experience for the sale of enriched uranium reactors.

While the aspect of replacement may be of some assistance competitively, the creation of interest in enriched uranium reactors is in our judgment a more important consideration. With such interest, the AEC believes that success in the sale of power reactors will depend primarily upon proven experience, product guarantees and manufacturing economics.

IMPACT ON IAEA INSPECTORATE BY CONTEMPLATED TRANSFER OF SAFEGUARDS

Chairman HOLIFIELD. Can you give us an estimate of the addition to the size of the IAEA inspection staff and budget that will probably result from execution of the United States-United Kingdom-IAEA trilateral safeguards agreement?

Dr. SEABORG. As I understand it, it would require six or seven inspectors.

Chairman HOLIFIELD. Who bears the expense of that?

Dr. SEABORG. It would require one inspector to cover the reprocessing and fabrication aspects and then perhaps one inspector on the average for each of the six reactors.

COST OF INSPECTIONS BORNE BY IAEA

Chairman HOLIFIELD. Who bears the expense of that inspection, the IAEA inspection? Are you still trying to work that matter out?

Dr. SEABORG. Under the current regulations the Agency bears the expenses but as you know this is a point of contention in the Board of Governors as to how it will be borne in the future. It is the view of the United States that it should be borne in the Agency.

Mr. CONWAY. The Russians, I think, want it borne by the participants.

Dr. SEABORG. By the inspectees. We think that is not the best policy.

Chairman HOLIFIELD. Do you have reason to believe that the IAEA will have the capability to perform this inspection task if this trend toward turning more and more reactors over to their responsibility continues?

Dr. SEABORG. This will be the policy of the United States to do everything that they can to see to it that the IAEA does have the capability. We think that this is very important to the nuclear power field, to the growing nuclear power field and throughout the world and certainly it is of importance in the prevention of the proliferation of nuclear weapons.

(Subsequently the following correspondence was exchanged by the committee and the Commission concerning the agreements with the United Kingdom:)

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., July 8, 1966.

Hon. GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR DR. SEABORG: You will recall that Chairman Holifield at the conclusion of the hearing on June 28, 1966 said that the Joint Committee might wish to submit several written questions to the Commission concerning the AEC's international program.[1] These questions are set forth below.

1. In your prepared statement concerning the proposed U.K. agreements you stated that the U.S. has had particularly beneficial cooperation with the U.K. in the fast reactor and gas cooled reactor development programs and in several areas of basic nuclear research, including controlled thermonuclear fusion. Please describe this cooperation generally.

2. On page 4 of your statement you noted that the quantity of U-235 to be provided to the U.K. under the new civil power agreement will be calculated "on the new adjusted net quantity basis which does not include the quantity of U-235 contained in natural uranium." Please describe the reason why the Commission has adopted this new system and how it differs from the former system used for calculating amounts transferred.

3. (a) Why have you agreed to allow the U.K. to reprocess and refabricate materials supplied to third countries by the United States and to blend U.K. material with U.S.-supplied material?

(b) Do you retain any control over approval of such arrangements?

(c) Has any U.S. material supplied to a foreign nation ever before been reprocessed or refabricated in another foreign nation?

(d) Is any country other than the United Kingdom allowed to blend its material with that of the United States?

4. How have you estimated the amount of U-235 (8,000 kilograms) needed for the United Kingdom civil power program? In this connection please provide the following information concerning the U.K. program:

(a) Reactor construction schedule;

(b) Amount of U-235 needed for each loading and refueling, and year of such requirement;

(c) United Kingdom diffusion plant production schedule; and

(d) Annual deficiency (difference between United Kingdom production and need).

5. Recent Commission estimates have put this country's installed nuclear generating capacity in 1970 at approximately 10,000 megawatts. How does this figure compare with the U.K.'s projections for 1970? What about the Commission's and the U.K.'s projections for 1980?

6. (a) Since international safeguards will apply to the 8,000 kilograms to be transferred under the new power agreement with the U.K., why should they not also apply to the smaller quantity of material to be transferred under the amended civil research agreement with the U.K.?

(b) Why are not U.S. safeguards applied under the civil research agreement in the absence of international safeguards?

7. A publication recently issued by the Greek Government said that Greece has been informed that her request for association with Euratom has been favor-

[1] See p. 105.

ably received and negotiations will commence soon to formalize this. Can you tell us more about this development? (The publication referred to is the May 1966 edition of "Greece—A Bulletin of Record and Analysis," p. 95, published by the Information Service of the Royal Greek Embassy in Washington.)

In addition to your answers to the foregoing questions, it would be appreciated if the Commission would furnish the Committee a separate statement concerning the considerations that have shaped United States policy toward the distribution of enriched uranium abroad. It would also be appreciated if in this connection you would discuss the specific question of whether sales of enriched uranium for nuclear power purposes or the provision of uranium enirchment services by the U.S. to countries or international organizations such as the U.K. and Euratom enhance the competitive position of other nations as against the U.S.; and if so, why the AEC favors such arrangements.

Finally, in connection with Mr. Hall's letter of June 9, 1966, informing the Committee that the amendment to the Turkish agreement which was before the Committee on May 26 was not ratified prior to the June 9 expiration date of the basic agreement, it would be appreciated if the Commission would furnish for the record copies of the diplomatic notes concerning the continuation of safeguards which we understand were exchanged to fill this gap.

Sincerely yours,

JOHN T. CONWAY, *Executive Director.*

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 1, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: I am pleased to forward the enclosed replies to the questions concerning the proposed civil bilateral with the United Kingdom as requested in your letter of July 8, 1966.

As requested, we have also included a separate statement concerning the considerations that have shaped United States policy toward the distribution of enriched uranium abroad, including a discussion of whether sales of enriched uranium for nuclear power purposes or the provision of uranium enrichment services by the U.S. to countries or international organizations enhance the competitive position of other nations as against the United States.

We understand that the Government of Greece has expressed informally to Euratom its interest in a relationship with that organization and that the desirable nature of this relationship, whether association, full membership, or other, is under consideration by the Government. We are informed that no formal application has been submitted to the Euratom Council of Ministers.

With respect to the amendment to the Turkish Agreement, Mr. Hall's letter of July 19 provided copies of the safeguards notes exchanged with the Government of Turkey,[1] as well as copies of the notes which brought the amendment into force.

Cordially,

GLENN T. SEABORG, *Chairman.*

Enclosures: (1) Answers to Questions Concerning the Agreement for Cooperation with the United Kingdom. (2) Statement Concerning Considerations Which Have Shaped U.S. Policy toward the Distribution of Uranium Abroad.[2]

ANSWERS TO QUESTIONS CONCERNING THE AGREEMENT FOR COOPERATION WITH THE UNITED KINGDOM

1. *Question.* In your prepared statement concerning the proposed U.K. agreements you stated that the U.S. has had particularly beneficial cooperation with the U.K. in the fast reactor and gas cooled reactor development programs and in several areas of basic nuclear research, including controlled thermonuclear fusion. Please describe this cooperation generally.

Answer. There follows a brief description of the U.S.—U.K. exchange agreements referred to:

a. *Fast Reactors:* The Fast Reactor Exchange, originally developed in 1956, was expanded in early 1965 to include an "across the board" exchange of

[1] See app. 5, p. 179.
[2] Set forth on p. 95.

research and development data on all types of fast reactors for civil, land-based power stations, up to and including construction and operation of prototype reactors, except for detailed reactor design and fuel manufacturing know-how. The new agreement is scheduled to continue for ten years, after which either party can terminate by giving one year advance notice.

b. *Libby-Cockcroft:* This agreement began in 1958 and provides for exchanges in specific areas of research and development, including basic research; controlled thermonuclear reactions; uranium oxide fuels technology; gas coolant compatibility, including graphite chemistry and physics, and metals and ceramics; beryllium technology; and plutonium recycle research. In January 1966, a new area of exchange was added under Libby-Cockcroft covering the effects of irradiation on cladding and structural materials.

c. *Gas Cooled Reactors (AGR–EGCR):* This agreement, beginning in 1959, and extended for a further three years in July 1965, provides for exchange of information concerning the development, design, construction, and operation of the Windscale Advanced Gas-Cooled Reactor and the HERO reactor on the one hand and the Oak Ridge Experimental Gas Cooled Reactor (EGCR) on the other. The exchange includes conceptual design, construction and operating information of the three projects. It excludes detailed manufacturing techniques for fuel elements and detailed reactor design information. As a result of the discontinuation of the EGCR project, the AEC is now considering various possibilities regarding the future of this exchange.

d. *Uranium Feed Materials:* This agreement, in effect since 1960, provides for exchange of information on feed materials, including digestion, extraction, denitration, reduction and hydrofluorination.

e. *Dragon Project:* An agreement between the U.S. and the UKAEA acting for and on behalf of the Dragon Project signatories, provides for an exchange of information on the Dragon reactor experiment at Winfrith, and the High Temperature Gas Cooled Reactor at Peach Bottom, Pennsylvania. The Dragon Project is a multi-national project under the European Nuclear Energy Agency to produce information leading to the design of an economic high temperature gas cooled reactor. This agreement began in 1959 and was extended in 1964 for an additional three years.

In addition to the above formal exchanges, there are active informal exchanges in various areas including, for example, reactor safety, radioactive waste treatment and disposal, and chemistry.

2. *Question.* On page 4 of your statement you noted that the quantity of U–235 to be provided to the U.K. under the new civil power agreement will be calculated "on the new adjusted net quantity basis which does not include the quantity of U–235 contained in natural uranium." Please describe the reason why the Commission has adopted this new system and how it differs from the former system used for calculating amounts transferred.

Answer. The net amount of U–235 which would be transferred under the Agreement would be calculated on the new net adjusted basis in order to take account of the situation resulting from the provision of toll enrichment services starting January 1, 1969. Apart from this, the revised method also gives considerably greater weight to the transfer of enriched uranium of higher assay than did the former system and is a more realistic measure of United States' effort in furnishing material of different isotopic assays. This new formula was initially incorporated in the Amendment to the Agreement for Cooperation with Spain[1] and the new power-type Agreement with Switzerland, which were submitted to the Joint Committee on December 1, 1965 and January 12, 1966, respectively.[2]

Prior to these Agreements, the AEC had consistently used the net ceiling concept under which the total quantity of material transferred was calculated in terms of the net amount of contained U–235 in uranium transferred to the cooperating country less the quantity of contained U–235 returned to the U.S. or transferred to another nation or group of nations with the approval of the U.S. While this formula had been satisfactory prior to the toll enrichment legislation as a method for fixing the transfer ceiling in our Agreements, it could create difficulties in the case where toll enrichment applies since, under the formula, the U.S. would have to give the country credit for the U–235 contained in the natural uranium offered as feed for toll enriching. This is turn would make the ceiling meaningless since the contained U–235 in the quantities of natural uranium offered for feed will always exceed the contained U–235 in the product withdrawals from the cascade. Therefore, a revised method of calculation is being incorporated, as appropriate, in new agreements and amendments to provide that the net amount,

[1] See app. 1, p. 121.
[2] See app. 1, p. 127.

for purposes of either debiting or crediting, will be the difference between the quantity of U–235 in the enriched uranium transferred and the quantity of U–235 contained in an equal quantity of uranium of normal isotopic assay.

3. *Question.* (a) Why have you agreed to allow the U.K. to reprocess and refabricate materials supplied to third countries by the U.S. and to blend U.K. material with U.S.-supplied material?

(b) Do you retain any control over approval of such arrangements?

(c) Has any U.S. material supplied to a foreign nation ever before been reprocessed or refabricated in another foreign nation?

(d) Is any country other than the United Kingdom allowed to blend its material with that of the United States?

Answer. (a) The fundamental and long-term consideration in the policy of allowing other countries, including the United Kingdom, to reprocess and fabricate materials supplied to third countries is the belief that the elimination of commercial restrictions on the supply of enriched uranium abroad will encourage countries considering nuclear power reactors to select those using enriched uranium and thus enhance the competitive position of U.S. industries.

This policy resulted from a careful review of AEC supply policies in 1961 when the Commission sought to further strengthen its assurances to users of enriched uranium abroad that this material would be available on a long-term basis and on reasonable and non-discriminating terms. Given the already difficult problems of being the sole source of supply for enriched uranium, and of attaching safeguards requirements, it was decided that the attachment of a further condition, namely that the supply of U.S. material was contingent upon the use of U.S. manufactured equipment or U.S. services, would greatly decrease confidence in the U.S. as a dependable supplier of enriched uranium.

(b) Requests under the Agreement for material to be fabricated for third-countries would be submitted to the AEC and supply of the material would depend upon the conclusion of an appropriate sale or lease contract. The subsequent retransfer to the third country is also subject to AEC approval prior to transfer and pursuant to established formal procedures. Each request is thus subject to Commission control and approval.

(c) The following instances of third-country reprocessing or fabrication have occurred:

1. U.S. enriched uranium has been transferred to Germany for fabricating elements for Sweden, South Africa and Austria for use in research reactor in each of those countries.
2. U.S. enriched material to be used by France in a test reactor and an experimental power reactor has been transferred to Canada for fabrication.
3. Sweden has received U.S. origin enriched uranium for fabricating elements for a research reactor in Germany.
4. France has fabricated U.S. origin enriched uranium for a Swiss research reactor.
5. Enriched material for use in the Halden Project research reactor in Norway has been transferred to the U.K. for fabrication.
6. Enriched material of U.S. origin which was irradiated in a Danish research reactor has been transferred to the U.K. for reprocessing.
7. U.S. enriched uranium leased to Euratom for use in the French Pegase test reactor has been transferred to the U.K. for reprocessing.

(d) Our Agreements for Cooperation contain no prohibition against a country blending its material with that obtained from the U.S. In the case of leased material, the lease contract contains a provision that the lessee shall not blend special nuclear material obtained under the lease without the prior consent of the Commission. Countries blending material which has been purchased from the U.S. are required to advise us of such arrangements for safeguards purposes.

4. *Question.* How have you estimated the amount of U–235 (8000 kilograms) needed for the United Kingdom civil power program? In this connection please provide the following information concerning the U.K. program:

(a) Reactor construction schedule;

(b) Amount of U–235 needed for each loading and refueling, and year of such requirement;

(c) United Kingdom diffusion plant production schedule; and

(d) Annual deficiency (difference between United Kingdom production and need).

Answer. The estimate of 8000 kg of U-235 needed for the U.K. civil power program is in the nature of a "best assessment" based on several assumptions regarding the rate of reactivation of Capenhurst and the construction schedule,

as well as the scale, of the second nuclear power program. The U.K. has informed us that it is conceivable that they might need much less than 8000 kg and equally conceivable that they might need more.

Based on the information which we have available, we have developed the following table which indicates an assumed reactor construction schedule, the amount of U-235 needed, the expected production at Capenhurst, and the expected amounts required from the U.S. All figures in the table are calculated on the basis of the net adjusted formula which will be used in calculating the amount of U-235 transferred under the agreement. This formula excludes from the total quantity of U-235 the amount of U-235 contained in an equal quantity of natural uranium.

U.K. requirements for enriched uranium for second nuclear power program

[In Kgs of U-235]

Years	Number of stations	Enriched uranium requirements			Amount produced by the United Kingdom	Amount required from the United States
		Initial core	Replacements	Total		
68–69	0	2,400	0	2,400	2,400	0
69–70	1 (1,200 MWe)	2,400	580	2,980	2,400	580
70–71	2 (1,200 MWe)	2,400	1,160	3,560	3,000	560
71–72	3 (1,200 MWe)	2,400	1,740	4,140	3,000	1,140
72–73	4 (1,200 MWe)	3,600	2,610	6,210	3,600	2,610
73–74	5 (1,800 MWe)	3,600	3,480	7,080	3,600	3,480
74–75	6 (1,800 MWe)	0	4,060	4,060	4,060	0
	Total			30,430	22,060	8,370

ASSUMPTIONS

1. The quantity of enriched uranium containing 1.5% U-235 for initial core loadings is estimated to be 304,000 kgs of U for a 1,200 MWe station and 456,000 kgs of U for a 1,800 MWe station.
2. The quantity of enriched uranium containing 2.0% U-235 for replacement fuel is estimated to be 45,000 kgs of U per year for a 1,200 MWe station and 67,500 kgs of U per year for an 1,800 MWe station.
3. The enriched uranium requirements are based upon the "net amount" concept.
4. The average discharge assay of spent fuel would be less than 1% U-235; therefore, the annual returns of enriched uranium would be negligible based upon the "net amount" concept.

(a) The assumed reactor construction schedule is based on the U.K. Government statement that they hope to construct one station per year, during the six year period 1969–75, for a total of approximately 8000 MWe. They have contracted for the first station, a 1200 MWe plant due for startup in 1969–70, and have indicated that the second station will be another 1200 MWe plant. They have also mentioned the possibility of constructing larger stations, possibly of 1800 MWe or 2400 MWe. Therefore, we have assumed that the first four stations will be of 1200 MWe capacity and the last two stations of 1800 MWe capacity. Of course, a different schedule, either in timing or size, would raise or lower the requirements for U.S. fuel.

(b) The amount of U–235 needed is based on a calculation of requirements for the reactor construction schedule, providing a lead time of one year and assuming a 1.5± enrichment for initial cores. The replacement fuel requirements are based on an assumed replacement of one-fifth of the core per year, at an enrichment of 2%.

(c) The U.K. has not provided any definite figures on expected production at Capenhurst, but has given us an estimate on the basis of their planned reactivation schedule. The AEA expects to be able to provide all requirements for the initial cores during the construction period and to be able to meet operating requirements (replacements) of all stations after construction is completed (in 1975). However, they do not expect to the able to produce enough material to meet replacement requirements of completed reactors during the years of 1969–1974 when initial cores are being fabricated. With the expectation of a graduated increase in Capenhurst production from 2400 kg in 1968–69 to over 4000 kg in 1975, the plant should be able to provide about 22,000 kg of the total requirement of 30,430 kg (calculated on the net adjusted basis).

5. *Question.* Recent Commission estimates have put this country's installed nuclear generating capacity in 1970 at approximately 10,000 megawatts. How does this figure compare with the U.K.'s projection for 1970? What about the Commission's and the U.K.'s projections for 1980?

Answer. The objective of the first official nuclear power program announced by the United Kingdom called for 5,000 MW of nuclear power capacity by 1968, a figure that will very nearly be met when Sizewell, Dungeness–A and Oldbury have been completed in 1966–67. Completion of Wylfa Head, scheduled for 1969, will bring the total U.K. MW capacity to 5,175 by 1970 as compared to the Commission's recent estimate of U.S. installed capacity at approximately 10,000 MW.

The second nuclear power program announced by the U.K. calls for the commissioning of an additional 8,000 MW by the end of 1975. This would give a total U.K. MW capacity of 13,175 MW by 1976. The U.K. has not yet announced any firm plans beyond 1975, and while we have no official estimates, upon basis of studies performed, we can project the total U.K. nuclear capacity by 1980 to approximately 25,000 MW. In contrast, the Commission's most recent analysis now estimates that there will be between 80,000 to 110,000 MW installed in the U.S. by 1980.

6. *Question.* (a) Since international safeguards will apply to the 8,000 kilograms to be transferred under the new power agreement with the U.K., why should they not also apply to the smaller quantity of materials to be transferred under the amended civil research agreement with the U.K.?

(b) Why are not U.S. safeguards applied under the civil research agreement in the absence of international safeguards?

Answer. (a) The highly enriched material which would be supplied to the U.K. under the amended civil research agreement would be used in facilities where both unclassified civil research and development and classified defense activities are undertaken. Separation of the civil and defense programs to the extent necessary to permit the application of international safeguards to the material supplied for the civil program would entail substantial cost and lead to extensive delay in the U.K. program.

(b) The absence of bilateral safeguards in the civil research agreement reflects the close relationship in nuclear matters which developed with the U.K. during World War II and the mutual defense collaborations which has continued since that time. In view of this special relationship, no bilateral safeguards were provided in the 1955 Agreement for Cooperation or the subsequent amendments, and it is believed that the same considerations warrant a continuation of this policy in the current amendment. This amendment would, of course, continue the U.K.'s guarantee in the original agreement that no material, equipment or device transferred under the agreement will be used for atomic weapons, for research on or development of atomic weapons, or for any other military purpose.

Chairman HOLIFIELD (presiding). We will now move to the Philippine bilateral.

PROPOSED AMENDMENT TO CIVIL AGREEMENT WITH THE PHILIPPINES

Representative HOSMER. Mr. Chairman, I ask unanimous consent that the statements before us by Dr. Seaborg and Mr. Herman Pollack be included in the record as though read and with the explanation that the necessity for an amendment to the Philippine agreement was pointed out to the Philippine authorities both by Mr. Ramey of the Commission and myself last fall when we were over there and learned that they were intending to renew the fuel elements in their research reactor.

They wanted to put in a fuel supply enriched to 93 percent. However, their bilateral did not allow the enrichment to go up that high and they were advised by Mr. Ramey and myself to get things moving to amend the bilateral.

That is the amendment before us and I am personally satisfied that it requires no detailed questioning.

Chairman HOLIFIELD. I thank the gentleman from California for his suggestion and without objection the various statements will be received at this point.

(The statements referred to follow:)

STATEMENT OF DR. GLENN T. SEABORG, CHAIRMAN, ATOMIC ENERGY COMMISSION, CONCERNING PROPOSED AMENDMENT TO THE AGREEMENT FOR COOPERATION WITH THE REPUBLIC OF THE PHILIPPINES

Mr. Chairman and members of the committee, I am pleased to be here to testify on the proposed Amendment to the Agreement for Cooperation with the Philippines.

The main purpose of the amendment, in response to a specific request of the Philippine Government, is to ensure that the material required to refuel the 1 MW(t) research reactor at the Diliman reactor center, Quezon City, can be provided at 93% enrichment. Although previously it was our practice to amend agreements such as that with the Philippines to provide 90% material, the Philippine Agreement was not so amended. Now, the standard enrichment produced for research reactor fuel is the 93% desired by the Philippines and we have been providing for such enrichment in more recent amendments. Fuel of this enrichment is not only more economic, but also provides more efficient neutron generation and widens the experimental use of the reactor.

Because highly enriched material could be transferred, provision is also made in the proposed amendment for our standard comprehensive bilateral safeguards. Inasmuch as the Philippine reactor and fuel are presently under IAEA safeguards pursuant to a 1965 trilateral agreement, the U.S. safeguards in the proposed amendment would remain suspended as long as Agency safeguards are in force. U.S. safeguards would be resumed, of course, if Agency safeguards should cease to apply for any reason.

The remaining significant provisions of the amendment reflect the new authority in the 1964 "Private Ownership" Act respecting privately-arranged transfers of special nuclear material and also extend to the Philippines the standard provisions in other comprehensive Agreements.

Mr. Chairman, this concludes my remarks. I shall be pleased to answer whatever questions members of the Committee may have.

STATEMENT OF HERMAN POLLACK, DEPARTMENT OF STATE, CONCERNING PROPOSED AMENDMENT TO THE AGREEMENT FOR COOPERATION WITH THE REPUBLIC OF THE PHILIPPINES

Mr. Chairman, in addition to the comments which I have made concerning the agreements with the United Kingdom, I should also like to express the support of the Department of State for the other matter which the Joint Committee is considering today. This is the amendment which has just been negotiated to authorize the transfer of nuclear material with a high degree of enrichment to the Republic of the Philippines.

The Department is pleased to see this development, which will enable the Philippine research program to proceed on a more advanced basis by providing access to uranium enriched to a higher degree than was previously authorized.

The Department of State supports not only the provisions for highly enriched uranium and comprehensive safeguards, but also the additional standard provisions which have been incorporated in this as well as other recent agreements concerning private ownership under the terms of legislative changes which have occurred since the original agreement was negotiated.

Thank you, Mr. Chairman.

Chairman HOLIFIELD. There might be one or two questions which we could put to the witnesses for the record if you can answer them expeditiously. What quantity of nuclear material is involved in the Philippine agreement?

Dr. SEABORG. There is no change made. It still has a ceiling of 6 kilograms.

Chairman HOLIFIELD. Article IV of the amendment would add the words "or group of nations" to paragraph B, article VII of the existing agreement (see app. 1, p. 152). What is the purpose of this amendment?

Dr. SEABORG. Mainly to bring it in line with other agreements.

IAEA SAFEGUARDS INSPECTIONS

Chairman HOLIFIELD. Has the IAEA made any inspections of Philippine nuclear facilities since the international organization assumed responsibility for safeguards in 1965?

Dr. SEABORG. They have made two such inspections.

Chairman HOLIFIELD. And they found everything satisfactory?

Dr. SEABORG. They did.

SISTER LABORATORY ARRANGEMENT

Chairman HOLIFIELD. Does any AEC national laboratory have a sister laboratory relationship with the Philippines?

Dr. SEABORG. For the past 5 years AID has financed a program of assistance to the Philippine AEC under which the University of Virginia has provided assistance similar to our sister laboratory arrangements.

Chairman HOLIFIELD. We have some other questions which we may submit in writing but we have a quorum call on at the present time so unless there is anything further that the Commission wishes to say we will adjourn the meeting now.

Thank you, gentlemen.

(The referenced questions and the AEC's answers thereto are set forth beginning on p. 98.)

(Whereupon, at 12:25 p.m., Tuesday, June 28, 1966, the subcommittee adjourned, subject to call of the Chair.)

INTERNATIONAL AGREEMENTS FOR COOPERATION—1966

THURSDAY, AUGUST 25, 1966

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON AGREEMENTS FOR COOPERATION,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C.

The subcommittee met at 10:05 a.m., pursuant to call, in room AE–1, the Capitol, Senator Albert Gore presiding.

Present: Senator Gore and Representative Young.

Also present: John T. Conway, executive director; Edward J. Bauser, assistant director; Leonard M. Trosten, staff counsel; James B. Graham, technical adviser; and Jack Rosen, technical consultant.

Senator GORE. Good morning, Chairman Seaborg.

Today's meeting of the Subcommittee on Agreements for Cooperation is for the purpose of considering a proposed superseding agreement to the agreements for cooperation with the Government of Israel and the Republic of China and a proposed new agreement with Sweden. All three agreements concern civilian uses of atomic energy.

In accordance with committee procedure copies of the new agreement with Sweden and the amendment to the agreement with Israel, together with supporting correspondence, were inserted in the Congressional Record on August 23, 1966. A copy of the amendment to the agreement with the Republic of China, together with supporting correspondence, received by the Joint Committee on August 23, 1966, was inserted in the Congressional Record on August 24, 1966.

Without objection I will insert at an appropriate point in the record of this hearing copies of these materials together with statements relative thereto which I made on the floor of the Senate in submitting them for publication in the record.

(The statements referred to are set forth below; the texts of the referenced agreements and their supporting correspondence are set forth in App. 1, p. 121.)

Senator GORE. Dr. Seaborg, I understand you will be our first witness. Please proceed.

[Reprinted from Congressional Record of Aug. 23, 1966, p. 19437]

PROPOSED AGREEMENT FOR COOPERATION WITH SWEDEN AND PROPOSED AMENDMENT TO AGREEMENT FOR COOPERATION WITH ISRAEL

Mr. GORE. Mr. President, as Chairman of the Subcommittee on Agreements for Cooperation of the Joint Committee on Atomic Energy I wish to inform the Senate that pursuant to Section 123(c) of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to the Joint Committee a proposed amendment to the existing civil agreement for cooperation between the United States and the Government of Israel, and a proposed new agreement

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for cooperation concerning civil uses of atomic energy between the United States and the Government of Sweden. The proposed agreement for cooperation with the Government of Sweden was received by the Joint Committee on August 4, 1966. The proposed amendment to the agreement for cooperation with the Government of Israel was received on August 19, 1966.

The proposed new agreement with the Government of Sweden supersedes the agreement between these two parties which was signed on January 18, 1956, as well as the amendments thereto. The purpose of the new thirty year agreement with the Government of Sweden is to provide a means for assuring a long term supply of enriched uranium fuel required by Sweden for its projected nuclear power program. The agreement would reflect changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear materials by enabling private parties in the United States and Sweden to be parties to arrangements for the transfer of special nuclear material. A feature of the new agreement with Sweden is that it would provide for the transfer of safeguards responsibility to the International Atomic Energy Agency.

The proposed agreement would increase the maximum quantity of uranium-235 that could be transferred to Sweden from the limit under the present agreement which is 400 kilograms to a limit of 50,000 kilograms specified in the proposed new agreement.

The proposed amendment to the agreement with the Government of Israel would raise from ten to forty kilograms the net quantity of uranium-235 which may be transferred to Israel for fueling of research reactors. In addition there would be provision for the transfer of material enriched to more than 20% in the uranium-235 isotope when a technical or economic justification for such a transfer exists. Additionally the amendment to the agreement with Israel would reflect recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Israel to be parties to arrangements for the transfer of special nuclear material.

Section 123(c) of the act requires that these proposed agreements lie before the Joint Committee for a period of 30 days while Congress is in session before becoming effective. It is the general practice of the Joint Committee to publish proposed civil agreements for cooperation in the Record and to hold public hearings thereon.

In keeping with this practice, I ask unanimous consent to have printed at this point in the Record the text of the new agreement and the proposed amendment to the existing agreement together with supporting correspondence.

[Reprinted from Congressional Record of Aug. 24, 1966, p. 19582]

Proposed Amendment to Agreement for Cooperation With Republic of China

Mr. Gore. Mr. President, as Chairman of the Subcommittee on Agreements for Cooperation of the Joint Committee on Atomic Energy, I wish to inform the Senate that pursuant to section 123(c) of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to the Joint Committee a proposed amendment to the existing civil agreement for cooperation between the United States and the Republic of China. The proposed amendment was received by the Joint Committee on August 23, 1966.

Yesterday I informed this body of a proposed agreement for cooperation with Sweden and a proposed amendment to the agreement for cooperation with Israel previously received by the Joint Committee. See page 19437 of Congressional Record of August 23. The proposed agreement with Sweden and the proposed amendments to the agreements with Israel and China will be the subject of a Subcommittee public hearing scheduled for Thursday, August 25, 1966.

The proposed amendment to the agreement for cooperation with the Republic of China would increase to 8 kilograms the quantity of uranium-235 which may be transferred to the Republic of China for fueling of research reactors. The amendment would also reflect changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear materials by enabling private parties in the United States and the Republic of China to be parties to arrangements for the transfer of special nuclear material.

Special nuclear material transferred under the existing agreement and under the amended agreement will be covered by safeguards administered by the International Atomic Energy Agency.

Section 123(c) of the Act requires that the proposed amendment lie before the Joint Committee for a period of thirty days while Congress is in session before

becoming effective. It is the general practice of the Joint Committee to publish proposed civil agreements for cooperation in the Record and to hold public hearings thereon .

In keeping with this practice, I ask unanimous consent to have printed at this point in the Record the text of the proposed amendment together with supporting correspondence.

STATEMENT OF DR. GLENN T. SEABORG, CHAIRMAN, ACCOMPANIED BY D. SAMUEL NABRIT, COMMISSIONER, U.S. ATOMIC ENERGY COMMISSION

Dr. SEABORG. I appreciate this opportunity to make a statement to the committee on the proposed new agreement with the Government of Sweden for cooperation in the civil uses of nuclear energy and on the proposed amendments to the cooperation agreements with Israel and China.

POWER AGREEMENT WITH SWEDEN

The proposed agreement with Sweden would supersede the current research and power agreement which would expire on June 1, 1968. This proposed agreement is another of the type into which we have entered during this past year for the primary purpose of insuring our bilateral partners of the long-term availability of enriched uranium for their planned nuclear power programs. The agreements concluded with Spain and Switzerland earlier this year are previous examples of this type. (See app. 1, p. 121.)

In all three of these cases the agreements are long term with a view to covering the approximate lifetime of the reactors concerned. These reactors are in each case listed in an annex to the agreement. The quantity of fuel to be transferred under each agreement is calculated on the basis of the requirements of these planned reactors for the term of the agreement. For Sweden's planned power reactor construction, and research activities, the proposed agreement establishes the amount of U^{235} which may be transferred at a maximum of 50,000 kilograms:

TOLL ENRICHMENT SERVICES

The transfer of this material would be either through sale or toll enrichment. The latter service is provided for beginning January 1, 1969, in article VII, paragraph D, of the agreement. As in the case of the Spanish, Swiss and United Kingdom civil power agreements, the amounts of material transferred under the agreement would be calculated on a net adjusted basis to take account of toll enriching transactions.

VALUE OF MATERIAL AND TOLL ENRICHMENT SERVICE

Senator GORE. About what would be the money value of the materials herein provided for transfer?

Dr. SEABORG. 50,000 kilograms of uranium 235 with the degree of enrichment here would be something like $8,000 a kilogram and then that would be 8,000 times the 50,000 which would be $400 million if we sold it all, but we contemplate that the major part of this would be acquired through the toll enriching process.

Senator GORE. The major part of the $400 million?

Dr. SEABORG. No; the major part of the 50,000 kilograms would be acquired through the toll enrichment process which would mean that we would have an inflow of gold through the purchase of the enriching service of about half that figure, I would estimate.

Senator GORE. The reason I ask this question is that I wanted to get some relation of the export value of enriched uranium and plutonium with reference to our balance-of-payments problem. If $400 million is involved here, then it is a significant figure.

Dr. SEABORG. It is a significant figure; yes, or even if it is half of that as the result of the toll enrichment process.

Senator GORE. You stimulate my curiosity about the total export value of uranium and plutonium under the bilateral programs—not just this one, but the others also.

Dr. SEABORG. This is really the largest with any single country so far.

Senator GORE. But we have agreements with several other countries?

Dr. SEABORG. We have several other countries and I imagine there will be additional countries in the future.

Senator GORE. Would you say the agreements with other countries combined would equal the magnitude of the present one, the one presently under consideration?

AMOUNT OF ENRICHED URANIUM EXPORTED BY UNITED STATES

Dr. SEABORG. Yes; the total, involving other countries, will be more than the total for Sweden. The total to date for all countries is about 200,000 kilograms.

Senator GORE. Then it will be considerably larger?

Dr. SEABORG. Yes; and there would be more in the future.

Senator GORE. If the 50,000 kilograms here can be equated to an approximate $400 million, then 200,000 kilograms would be four times that.

I see here on a previous statement it has been estimated by the Treasury Department that U.S. sales of enriched uranium abroad may total 200,000 kilograms by 1980.

Dr. SEABORG. The 200,000 kilograms in a sense is only a beginning.

Senator GORE. I think our people will be very interested in this. Here is something in which the United States has taken a lead and from which it appears that we are to reap some profits also.

Dr. SEABORG. That is right.

Senator GORE. Do you have any questions along this line, Congressman Young?

Representative YOUNG. No, sir.

Dr. SEABORG. This is a point we have already made.

TRANSFER OF SAFEGUARDS RESPONSIBILITIES TO IAEA

In addition to providing for the transfer of U^{235} for Sweden's power program, a second major purpose of the new agreement is to provide for the transfer of safeguards responsibilities to the International Atomic Energy Agency. Earlier negotiations on the agreement had beed delayed while the Agency was reviewing its safeguards last year to cover reactors above 100 megawatts thermal. Having re-

viewed the revised safeguards and found them satisfactory, the Government of Sweden agreed to transfer safeguards responsibilities under the bilateral to the Agency. Article XI of the agreement, therefore, as in the case of other agreements, provides that the Agency will promptly be requested to assume this responsibility and that if the parties should fail to agree, the bilateral may be terminated. (See app. 1, p. 121.)

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIAL

In this and other respects, the proposed agreement with Sweden is very similar to that with Switzerland which the committee reviewed earlier this year. In both cases, as well as in those of the United Kingdom agreement and the Philippine and Turkish amendments, the possibility of private transactions is recognized and provided for in accordance with applicable laws, regulations, policies, and license requirements of the parties.

AGREEMENT AUTHORIZES CONVERSION AND FABRICATION SERVICES WITHIN SWEDEN

One additional feature of the Swedish agreement would permit Sweden to perform conversion or fabrication services for third countries. This provision, in article VII, paragraph C, is subject to Commission approval on a case-by-case basis.

U.S. POLICY OF TRANSFERRING SAFEGUARDS TO IAEA

Mr. Chairman, I believe these are the major features of the proposed agreement. Its provisions reflect two significant aspects of U.S. policy. The first is the transfer of safeguards responsibilities to the IAEA, a process which your committee has advocated consistently and effectively.

U.S. POLICY CONCERNING DISTRIBUTION OF ENRICHED URANIUM ABROAD

Secondly, the agreement reflects U.S. policy to make enriched uraniun available abroad on a long-term basis to meet the needs of a cooperating country's planned nuclear power program. We believe that such a policy advances the cause of safeguards, creates valuable economic and political relationships, produces foreign exchange benefits, and creates conditions in which the technical and economic competitiveness of U.S. industry can play its role.

In the furtherance of these basic policies, we believe the agreement accords with the interests of the United States.

CIVIL AGREEMENT WITH ISRAEL

The proposed amendment to the agreement for cooperation with Israel has been prepared in response to a request from the Government of Israel for two specific modifications of the current agreement. Israel asked, first, that the net amount of U^{235} which may be transferred to fuel Israel's research reactor for the remaining 9 years of the current agreement be raised from 10 to 40 kilograms and, secondly, that the transfer of 93-percent enriched fuel be permitted. Inci-

dentally, I would like to add here that such material would be subject to the trilateral safeguards agreement which entered into force on June 15, 1966.

AMENDMENT AUTHORIZES INCREASE IN AMOUNT AND ENRICHMENT OF SPECIAL NUCLEAR MATERIAL

Both requests arise from Israel's plans for the future level of operation of the Nahal Soreq research reactor. This is a 5-megawatt thermal reactor which has been operating at about 2.5 megawatts. The Israelis desire to raise the operating power, to refuel with 93 percent enriched material, and to increase the number of hours in operation. Accordingly, article I of the proposed amendment would increase to 40 kilograms the net amount of U^{235} which could be transferred to Israel for rector fueling. In response to the request pertaining to enrichment, the amendment would replace the current provision permitting the transfer of 90-percent material with the provision we have been using more recently to permit the transfer of fuel enriched to more than 20 percent in U^{235}.

PRIVATE EXPORTS OF SPECIAL NUCLEAR MATERIAL

As in the recent amendments to our other agreement with Turkey and the Philippines, and in the United Kingdom and Swiss and proposed Swedish agreements, we have taken the opportunity to reflect the new authority in the 1964 Private Ownership Act respecting privately arranged transfers of special nuclear material. Article II of the agreement would permit private transactions in accordance with applicable laws, regulations, policies, and license requirements of the parties.

CIVIL AGREEMENT WITH REPUBLIC OF CHINA

The major purpose of the amendment to our agreement for cooperation with China is to provide for the transfer of fuel enriched to more than 20 percent in U^{235} when there is a technical or economic justification for such a transfer and to raise the net amount of U^{235} which, together with the amount of fuel needed for continuous and efficient operation of China's research reactor, may be transferred to, and be in China's possession, at any time. This raised net quantity would be 8 kilograms of U^{235} instead of the currently allowed 6 kilograms. China requested these modifications in connection with plans to operate the 1-megawatt THOR reactor at the Nuclear Science Institute at higher power levels for longer periods. These modifications would also provide China with greater flexibility in utilization of the reactor in research.

Inasmuch as highly enriched fuel would be transferred under the agreement, the standardly required comprehensive bilateral safeguards have also been incorporated. Since China's reactor and fuel are presently under IAEA safeguards pursuant to a 1965 trilateral agreement, the U.S. safeguards in the proposed amendment would remain suspended as long as Agency safeguards are in force.

Senator GORE. To which China are you referring?

Dr. SEABORG. The Republic of China, Formosa.

Senator GORE. Since I see some indication, with respect to the United Nations, that we may be considering a two-China policy, I thought you might like to differentiate.

Dr. SEABORG. I make the record clear on that point at this time.

Senator GORE. I am not trying to throw you into that corner.

U.S. SAFEGUARDS SUSPENDED WHILE IAEA'S APPLY

Dr. SEABORG. U.S. safeguards would be resumed, of course, if for any reason Agency safeguards should cease to apply.

As in the proposed Israeli amendment and Swedish agreement as well as the modifications incorporated in the agreements with Turkey, the Philippines, Switzerland, and the United Kingdom, the proposed Chinese amendment also reflects the new authority in the 1964 Private Ownership Act respecting privately arranged transfers of special nuclear material. The remaining provisions of the amendment are for the purposes of (*a*) bringing up to date the provision for the exchange of information, (*b*) combining language to eliminate redundancy, (*c*) adding the standard phrase, "group of nations," to the provision identifying those regarding whom the Commission might approve the transfer by China of material subject to the agreement and (*d*) revising references necessitated by the new language in the amendment.

Senator GORE. Dr. Nabrit, do you have a statement?

Dr. NABRIT. I have no statement.

Senator GORE. Mr. Pollack?

STATEMENT OF HERMAN POLLACK, ACTING DIRECTOR OF INTERNATIONAL SCIENTIFIC AND TECHNOLOGICAL AFFAIRS, U.S. DEPARTMENT OF STATE

Mr. POLLACK. I have a brief statement I would like to make on behalf of the Department of State.

Senator GORE. On which China?

Mr. POLLACK. The Republic of China.

Mr. Chairman, the Department of State has worked closely with the Atomic Energy Commission and with the Embassies of Sweden, Israel, and the Republic of China in the development of the agreements which now lie before your committee for consideration. I can assure you that these agreements carry the Department's approval from a foreign policy point of view.

POWER AGREEMENT WITH SWEDEN

The agreement with the Government of Sweden will supersede the agreement of January 18, 1956, as later modified by several amendments. This represents a normal transition from an agreement for cooperation in research activities to one in which our two Governments will cooperate in the development of nuclear energy as a significant source of electrical power generation in Sweden in future years.

THIRTY-YEAR TERM

Like the agreements which the joint committee has already considered for cooperation with Switzerland and Spain (see app. 1, p. 121) in the field of nuclear power generation, the new agreement with Sweden will extend for a period of 30 years. This period of time is appropriate in order to assure the purchasers that they may obtain nuclear materials and services from the United States for a sufficiently long period to justify their embarking on a long-term construction program with an assured source of supply. A program of the dimensions visualized by Sweden in this agreement will require a substantial capital investment in six large powerplants. This could not be undertaken without a reasonable degree of confidence that enriched uranium, or enrichment services, could be purchased from the United States over a full 30-year term.

WILL REPRESENT LARGEST POWER PROGRAM UNDER IAEA SAFEGUARDS

In one sense it could be said that agreements of this type represent the "coming of age" of nuclear cooperation in the international field, as nuclear reactors utilizing enriched uranium become normal parts of the power generating programs of countries with which we cooperate. In short, we view this as a natural and desirable extension of the cooperative arrangements between the United States and Sweden in the field of applied technology, consistent with similar arrangements with Switzerland and Spain, with which the committee is already familiar. The agreement with Sweden represents one additional step forward in our program to utilize the inspection facilities of the International Atomic Energy Agency for safeguarding the material and equipment furnished by the United States to other countries. Sweden and the United States both recognize the desirability of having their nuclear cooperative arrangements brought into the international safeguards system of the IAEA. After the agreement comes into effect negotiations will be initiated to effect a trilateral agreement with the IAEA and Sweden to provide for the Vienna agency to assume safeguards responsibilities. This will represent the largest power program under IAEA safeguards in a single country.

AGREEMENTS WITH ISRAEL AND CHINA

The amended agreements with Israel and China, which the committee is also considering today, have in common the provision for increasing the degree of enrichment of uranium provided by the United States for the research reactors in these two countries, which were developed under the United States program for cooperation in the peaceful uses of nuclear energy. Transfer of material enriched to more than 20 percent would be permitted when there is a technical and economic justification for this type of increase in enrichment levels to permit more effective civil research programs. In both cases this is viewed as a normal development in our cooperation on peaceful uses of the atom.

TRILATERAL AGREEMENTS CONCERNING IAEA SAFEGUARDS

In the case of both Israel and China, agreement had previously been reached to utilize the international safeguards system of the International Atomic Energy Agency on material and equipment received from the United States. The IAEA-United States-Chinese safeguards agreement became effective on October 29, 1965, while the IAEA-United States-Israeli agreement for the same purpose entered into effect on June 15, 1966.

From the standpoint of the Department of State, Mr. Chairman, we view all three of these bilateral agreements as representing desirable steps in the evolution of our scientific cooperation with Sweden, Israel, and the Republic of China. We are gratified to see these negotiations coming to a conclusion in a manner which will reinforce our efforts to strengthen the international application of adequate safeguards controls through the International Atomic Energy Agency.

Senator GORE. Thank you, Mr. Pollack.

SHIFT IN DIRECTION OF SWEDISH POWER PROGRAM?

Dr. Seaborg, does this requirement by Sweden for a large supply of unriched uranium signify a basic change in the Swedish power program, that is, a shift away from natural uranium heavy water reactors?

Dr. SEABORG. It might. Of course, it is our hope that it does. However, this does not necessarily represent their entire program in the nuclear power field and other countries that are advocating natural uranium-fueled reactors are also discussing with Swedish utilities with Sweden the possibility of their adopting reactors fueled with natural uranium.

However, the indications seem to be that this indicates a shift toward reactors fueled with enriched uranium.

APPLICATION OF IAEA SAFEGUARDS

Senator GORE. Do the IAEA safeguards apply only during the term of the bilateral arrangements?

Dr. SEABORG. There will be a separate trilateral agreement negotiated with Sweden involving Sweden, United States and the IAEA, and the term of that agreement will only be known at the conclusion of these negotiations and the final signing of that agreement. I imagine it would be our expectations that this trilateral agreement would remain in effect at least as long as the 30 years of our bilateral agreement.

Senator GORE. In the event that it turned out to be 10 instead of 30, what safeguards would you envision?

Dr. SEABORG. Then we would revert back to our bilateral safeguards, the kinds of safeguards involving the United States and Sweden that have been in effect up to the present time.

RECIPROCAL SAFEGUARDS PROVISION

Senator GORE. If the United States purchases special nuclear material from Sweden in accordance with this agreement, will IAEA safeguards apply to such produced materials?

Dr. SEABORG. Yes. I believe that they would.

Senator GORE. For how long?

Dr. SEABORG. The agreement has a reciprocal provision in that connection, so the IAEA safeguards would apply for as long as the trilateral agreement involving the IAEA is in effect, and it could go go beyond that. It could be indefinitely.

Senator GORE. Can you give assurance to the Congress that the Commission is satisfied with the security arrangements with respect to the agreement with Sweden, Israel, and the Republic of China?

Dr. SEABORG. Yes; I feel that the Commission is satisfied with the safeguards provisions under the IAEA and we can be assured that all of the precautions possible will be taken to prevent the diversion of fissionable material from peaceful to military purposes.

Senator GORE. Thank you very much.

I am going to submit for the record a brief list of questions and ask that you supply answers for the record.

Dr. SEABORG. We will be glad to do so.

(The questions referred to and the Commission's answers thereto follow:)

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., September 9, 1966.

Hon. GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR DR. SEABORG: Senator Gore, as you will recall, indicated at the close of the hearing on August 25, 1966 that a list of additional questions concerning the agreements considered at the meeting would be submitted to the Commission and that the Commission's answers thereto would be included in the record. The list of questions is attached.

It would be appreciated if the Commission's responses would be furnished to the Committee at your earliest convenience.

Sincerely yours,

JOHN T. CONWAY, *Executive Director.*

QUESTIONS RELATING TO PROPOSED NEW AGREEMENT WITH SWEDEN

1. Article IV of the proposed agreement states that special nuclear materials "for purposes other than fueling reactors and reactor experiements" may be transferred under the agreement. Would you please indicate what is envisioned to be allowed by these words?

2. Article VII(A) states that the Commission "will transfer" enriched uranium to the Government of Sweden. Will transfer of the material be by sale or lease?

3. Article VII(B) begins with the words "in addition" and speaks of Sweden's requirements for enriched uranium. Is it completely clear that the figure of 50,000 kilograms limits any and all material transferred under ths agreement, or are there any "additions" to the amount?

4. Article VII(B) states that the appendix to the agreement "may be amended from time to time by mutual consent without modification of this agreement." What is the necessity for this phrase and what kinds of changes would be contemplated?

5. Article VII(G) would allow transfer of material containing more than 20% U–235 "when there is a technical or economic justification for such transfer." What kind of criteria would be used in making this kind of judgment?

6. It is clear that the proposed agreement would commit the United States to furnish the entire amount of 50,000 kilograms. Is the Government of Sweden, under the terms of the agreement, required to accept transfer of the entire amount or is this in effect a unilateral commitment by the United States?

7. It is noted that the separation of 50,000 kilograms of U–235 would require in the vicinity of 14,000 tons of U_3O_8. If all of this uranium were supplied from the U.S., it would constitute approximately 10% of presently known domestic low cost uranium reserves. What control is the Commission exercising to ensure

that the U.S. through a series of bilateral arrangements does not overcommit its reserves to the detriment of our own civilian nuclear power industry?

8. Chairman Seaborg's letter to Chairman Holifield of August 3, forwarding the proposed agreement, states that the agreement contains reciprocal guarantees with respect to atomic weapons or other military use of materials and states that this guarantee is similar to that contained in the agreement between the U.S. and Switzerland.

(a) Does this represent the adoption of a new policy by the Commission which would be applied to future similar agreements for cooperation?

(b) Please elaborate and explain the nature of the obligations assumed by the U.S.

QUESTIONS RELATING TO PROPOSED AMENDMENT TO AGREEMENT WITH ISRAEL

1. The amendment would increase to 40 kilograms the amount of U–235 allowed to be transferred under the agreement with Israel.

(a) Would this "transfer" be by sale of lease?

(b) In what reactor or reactors would this material be used?

(c) Would use of this material be restricted to the reactor(s) named?

(d) Is research on this material outside of the reactor permitted? If so, what would the nature be and how are we assured of the nature of this research?

2. Why is there provision in Article I of the amendment for the transfer of special nuclear material enriched to more than 20 percent in U–235?

3. Please review the safeguards arrangements which govern in the case of U.S. special nuclear material transferred to Israel.

QUESTIONS RELATING TO PROPOSED AMENDMENT TO AGREEMENT WITH REPUBLIC OF CHINA

1. Why is provision made in Article II for an increase in both the quantity and enrichment of special nuclear material which may be transferred to China?

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., September 28, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: I am pleased to provide the enclosed replies in response to the questions concerning the Agreement for Cooperation with Swdeen and the Amendments to the Agreements with Israel and the Republic of China, which were contained in your letter dated September 9, 1966.

Sincerely yours,

G. F. TAPE, *Acting Chairman.*

QUESTIONS RELATING TO PROPOSED NEW AGREEMENT WITH SWEDEN

1. *Question.* Article IV of the proposed agreement states that special nuclear materials "for purposes other than fueling reactors and reactor experiments" may be transferred under the agreement. Would you please indicate what is envisioned to be allowed by these words?

Answer. Article IV is the framework within which special nuclear materials may be transferred for such non-fuel purposes as plutonium for neutron sources or for fission foils and standard counting discs and enriched uranium for fission chambers and foils. It recognizes the various scientific, industrial and medical applications of special nuclear materials other than as fuel for reactors.

2. *Question.* Article VII (A) states that the Commission "will transfer" enriched uranium to the Government of Sweden. Will transfer of the material be by sale or lease?

Answer. Material under Article VII (A) may be transferred either by sale or lease. It is the Commission's policy to sell (a) small amounts of enriched uranium for defined research applications and (b) the quantity of enriched uranium for use in fueling research and materials testing reactors which is in excess of a net value

of $125,000. The Commission will lease enriched uranium for fueling research and materials testing reactors in quantities up to a net value of $125,000. Whether a specific transfer will be made under a sale or lease arrangement will depend upon the terms requested by Sweden and the policies of the Commission pertaining to foreign materials supply which are in effect at the time of a request for a specific transfer.

3. *Question.* Article VII (B) begins with the words "In addition" and speaks of Sweden's requirements for enriched uranium. Is it completely clear that the figure of 50,000 kilograms limits any and all material transferred under this agreement, or are there any "additions" to the amount?

Answer. The figure of 50,000 kilograms of uranium enriched in the isotope U–235 represents the upper limit for all transfers of this material under the agreement. The phrase "In addition," was only used to separate the research activities mentioned in Article VII A from the power reactor program provided for in Article VII B. As provided in Article VIII, the 50,000 kilogram figure represents the maximum quantity of U–235 in enriched uranium which may be transferred from the United States to Sweden under Articles IV, VI and VII. No other article of the agreement authorizes transfers of special nuclear material.

4. *Question.* Article VII (B) states that the appendix to the agreement "may be amended from time to time by mutual consent without modification of this agreement." What is the necessity for this phrase and what kinds of changes would be contemplated?

Answer. The phrase quoted in the question has been included in the agreement in order to permit, without the necessity of a formal amendment to the agreement, adjustment of the projected utilization of enriched uranium expected to be transferred under the agreement. Inasmuch as the agreement has a thirty year term, it can be anticipated that the projects identified in the appendix may possibly be modified with respect to type, construction, and operating schedules, or quantities of fuel. Thus, although the maximum quantity transferable under the agreement cannot be modified without a formal amendment, it was considered advisable to permit revisions in the proposed utilization of that quantity without the need for a formal amendment.

5. *Question.* Article VII (G) would allow transfer of material containing more than 20% U–235 "when there is a technical or economic justification for such transfer." What kind of criteria would be used in making this kind of judgment?

Answer. Our basic policy is to confine transfers of enriched uranium to that containing a maximum of 20% in the isotope U–235. However, we recognize that in certain situations, uranium of a higher enrichment is technically or economically more advantageous to the user.

For instance, the use of highly enriched uranium may result in greater efficiency of operation and versatility of application of a research or test reactor. Also, the costs of fabricating fuel elements for research or test reactors is less for a particular U–235 enrichment, such as 93%, because domestic fabricators are routinely producing similar fuel elements at that enrichment.

6. *Question.* It is clear that the proposed agreement would commit the United States to furnish the entire amount of 50,000 kilograms. Is the Government of Sweden, under the terms of the agreement, required to accept transfer of the entire amount or is this in effect a unilateral commitment by the United States?

Answer. Sweden is not required to accept transfer of any fixed amount of enriched uranium under the agreement. However, under Article VII, paragraph H, the Commission's obligation to assure the availability of the entire quantity of enriched uranium allocated for a particular power reactor project during the term of the agreement is contingent on Sweden's initiating construction in accordance with the schedule set forth in the appendix to the agreement and executing a contract for that total quantity in time to allow the AEC to provide material for the first fuel loading. If Sweden should contract for a smaller quantity for any particular power project than is now estimated to be necessary, the remaining quantity will no longer be available for that project and the ceiling quantity of U–235 will be reduced accordingly. Paragraph F also contains a provisions pursuant to which the Commission's commitment may be reduced to the extent Sweden does not execute contracts for quantities of material the Commission has agreed to provide.

7. *Question.* It is noted that the separation of 50,000 kilograms of U–235 would require in the vicinity of 14,000 tons of U_3O_8. If all of this uranium were supplied from the U.S., it would constitute approximately 10% of presently known domestic low cost uranium reserves. What control is the Commission exercising to ensure that the U.S. through a series of bilateral arrangements

does not overcommit its reserves to the detriment of our own civilian nuclear power industry?

Answer. In accordance with the Atomic Energy Act of 1954, as amended, the President determines the quantities of special nuclear material to be made available for distribution at home and abroad. On February 2, 1966, the President announced that the quantities of enriched uranium to be made available for peaceful uses have been increased to a total 550,000 kgs of contained U–235. Of this total, 300,000 is for distribution to licensed users in the U.S. and 250,000 for distribution to foreign countries under the civil Agreements for Cooperation. This determination by the President is expected to cover allocations of material under present domestic licenses and foreign agreements for cooperation and those anticipated in the near future, whether distribution is to be by sale, lease, or toll enrichment arrangements. In connection with toll enrichment, to the extent that foreign ores are used under foreign toll enrichment contracts, domestic reserves would be unaffected.

8. *Question.* Chairman Seaborg's letter to Chairman Holifield of August 3, forwarding the proposed agreement, states that the agreement contains reciprocal guarantees with respect to atomic weapons or other military use of materials and states that this guarantee is similar to that contained in the agreement between the U.S. and Switzerland.

(a) Does this represent the adoption of a new policy by the Commission which would be applied to future similar agreements for cooperation?

(b) Please elaborate and explain the nature of the obligations assumed by the U.S.

Answer. The United States' guarantee respecting produced material in Article IX B of the superseding agreement with Sweden was requested by Sweden and is consistent with the following Presidential and AEC policy statement on November 18, 1956, in connection with the announced availability of U–235 for foreign distribution. President Eisenhower stated that "One of the steps I have approved is an offer to purchase at specific prices plutonium and uranium 233 produced in reactors abroad which are fueled with materials furnished under our agreements for cooperation. The materials so acquired by the United States will be used solely for peaceful purposes." This policy statement also provided that in any case in which the repurchased material is intermingled with other material and cannot, during its reprocessing, be kept separate from material produced in the United States, an equal amount of U.S. material will be reserved for peaceful purposes. The United States' guarantee of non-military use also applies to equipment or devices transferred from Sweden to the United States under the new or superseding agreement.

While the guarantee with respect to produced material is not new, the policy has not always been reflected in agreements for cooperation. However, similar commitments regarding the peaceful uses of produced material acquired by the U.S. are contained in the agreement with India covering the Tarapur Power Station and the agreements for cooperation with Japan, Switzerland, the U.K. and the IAEA. As for equipment and devices, our agreement with Switzerland contains a non-military use guarantee.

QUESTIONS RELATING TO PROPOSED AMENDMENT TO AGREEMENT WITH ISRAEL

1. *Question.* The amendment would increase to 40 kilograms the amount of U–235 allowed to be transferred under the agreement with Israel.

(a) Would this "transfer" be by sale or lease?

Answer. Material under Article II(A) may be transferred either by sale or lease. It is the Commission's policy to sell (a) small amounts of enriched uranium for defined research applications and (b) the quantity of enriched uranium for use in fueling research and materials testing reactors which is in excess of a net value of $125,000. The Commission will lease enriched uranium for fueling research and materials testing reactors in quantities up to a net value of $125,000. Whether a specific transfer will be made under a sale or lease arrangement will depend upon the terms requested by Israel and the policies of the Commission pertaining to foreign materials supply which are in effect at the time of a request for a specific transfer.

(b) In what reactor or reactors would this material be used?

Answer. Israel plans to utilize the 40 kilograms of material for fueling its Nahal Soreq research reactor during the remaining nine years of the agreement. The increased quantity would permit operation of the reactor under longer periods

at its designed rating of 5 MW. The reactor has been operated in the 2.5 MW range

(c) Would use of this material be restricted to the reactor(s) named?

Answer. As noted in (b) above, the allocation of the 40 kilograms of material to Israel was based on its planned operation of the Nahal Soreq reactor; however, subject to the 40 kilogram limitation and to Commission approval of other uses, the material could be used in or made available for other projects within the purposes set out in the agreement, *viz.*, "for fueling designed research reactors, materials testing reactors, and reactor experiments which the Government of Israel, in consultatiou with the Commission, desires to construct and which are constructed in Israel and as required in experiments related thereto."

(d) Is research on this material outside of the reactor permitted? If so, what would the nature be and how are we assured of the nature of this research?

Answer. Material under Article II A is for use in fueling defined research reactors, materials testing reactors or reactor experiments and as required in experiments related to such facilities. Thus, use of Article II A material for research outside the reactor is limited to experiments related to fueling a defined research facility. As for the assurance concerning the nature of use of the material, the supply arrangements specify the use to which the material is to be put. Assurances against use of materials received from the United States for military purposes are reflected in the guaranty made by Israel contained in the agreement and in the application of IAEA safeguards.

2. *Question.* Why is there provision in Article I of the amendment for the transfer of special nuclear material enriched to more than 20% in U–235?

Answer. Our basic policy is to confine transfers of enriched uranium to that containing a maximum of 20% in the isotope U–235. However, we recognize that in certain situations, uranium of a higher enrichment is technically or economically more advantageous to the user.

For instance, the use of highly enriched uranium may result in greater efficiency of operation and versatility of application of a research or test reactor. Also, the costs of fabricating fuel elements for research or test reactors is less for a particular U–235 enrichment, such as 93%, because domestic fabricators are routinely producing similar fuel elements at that enrichment.

3. *Question.* Please review the safeguards arrangements which govern in the case of U.S. special nuclear material transferred to Israel.

Answer. Under a trilateral agreement which became effective June 15, 1966, the International Atomic Energy Agency assumed responsibility for safeguarding material and equipment transferred to Israel under our agreement for cooperation and subject to the bilateral safeguards. Under the Agency's safeguards system, Israel maintains, with respect to the safeguarded material and equipment, a system of records and the safeguarded material and equipment are subject to Agency inspection.

Questions Relating to Proposed Amendment to Agreement With Republic of China

1. *Question.* Why is provision made in Article II for an increase in both the quantity and enrichment of special nuclear material which may be transferred to China?

Answer. China requested this amendment in order to take advantage of the greater economy and efficiency possible when uranium enriched to 93% is used in fueling its research reactor at Tsing Hua University and because increasing the fuel inventory from 6 to 8 kilograms allows for more spare fuel elements and consequently longer core life by interchanging spare fuel elements for irradiated ones.

Senator Gore. The committee is now recessed.

(The subcommittee recessed at 10:30 a.m., Thursday, August 25, 1966, to reconvene subject to call of the Chair.)

APPENDIXES

Appendix 1

Proposed Agreements for Cooperation With Supporting Correspondence

A. GOVERNMENT OF SPAIN

U.S. Atomic Energy Commission,
Washington, D.C., December 1, 1965.

Hon. Chet Holifield,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

Dear Mr. Holifield: Pursuant to section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter—

(*a*) An executed "Amendment to the Agreement for Cooperation Concerning the Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Spain";

(*b*) A copy of the letter from the Commission to the President recommending approval of the amendment; and

(*c*) A copy of the letter from the President to the Commission containing his determination that performance of the amendment will promote and will not constitute an unreasonable risk to the common defense and security, and approving the amendment and authorizing its execution.

The amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend and modify the agreement between the United States of America and the Government of Spain which was signed at Washington on August 16, 1957.

As we reported to the Joint Committee on June 4, 1964, the Government of Spain has for some time been desirous of receiving a general assurance from the United States concerning the availability of enriched uranium on a long-term basis for the Spanish nuclear power program. Accordingly, the amendment, extends the term of the United States-Spanish agreement from 1968 to 1988. Consistent with the private ownership legislation, production or enrichment services could be provided after December 31, 1968, and would be subject to such terms and conditions as are established by the Commission. In addition, the amendment increases the quantities of enriched uranium that can be transferred to Spain to cover the estimated long-term enriched fuel requirements of three Spanish nuclear power projects as well as the miscellaneous requirements of the Spanish research and development program. The net amount of enriched uranium that could be transferred to Spain under the fuel article has been raised from 500 to 8,500 kilograms of U^{235}. The three principal projects that will be covered by this increased amount are the 153-megawatt electrical Zorita or UEM power station, the 30-megawatt electrical DON prototype power reactor, and the 300- to 400-megawatt electrical Nuclenor power station.

Under the present agreement the Commission may, at its discretion, make available a portion of special nuclear material to be supplied as material enriched up to 90 percent for use in a materials testing reactor. The amendment broadens this provision in keeping with the approach the Commission generally follows in its new power agreements and permits the Commission, upon request and at its discretion to transfer material containing more than 20 percent in the isotope U^{235} when there is a technical or economic justification for such transfer.

Article II of the amendment provides for removal of the limitation on the amounts of materials, including special nuclear material, that may be transferred to Spain for defined research applications (other than for fueling reactors and

reactor experiments), and permits such materials to be made available on an "as may be agreed" basis when such material is not commercially available. A similar provision is incorporated in several of our other agreements.

Under articles III–A and IV, enriched uranium and other materials could be transferred (including loaned, subject to required governmental authorization) for defined research applications, including research reactors, materials testing reactors, reactor experiments, and reactor prototypes. The inclusion of the provision of loan is designed to reflect the cooperative arrangement the Commission is currently negotiating with Spain, as a part of which the initial enriched uranium and heavy water requirements for the Spanish heavy water, organic-cooled reactor prototype (DON) would be loaned to Spain over a period of 5 years.

Article VI of the amendment provides that the International Atomic Energy Agency will assume the responsibility for applying safeguards to materials and facilities subject to safeguards under the agreement for cooperation at least 6 months prior to the startup of the Spanish Zorita power reactor or by December 31, 1966, whichever date is earlier. This transfer of responsibility would be accomplished without further modification to the agreement by means of a trilateral agreement to be negotiated among the United States, Spain, and the IAEA.

The amendment will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of this amendment.

Cordially,

(Signed) GLENN T. SEABORG,
Chairman.

AMENDMENT TO AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF SPAIN CONCERNING CIVIL USES OF ATOMIC ENERGY

The Government of the United States of America and the Government of Spain,

Desiring to amend the Agreement for Cooperation Between the Government of the United States of America and the Government of Spain Concerning Civil Uses of Atomic Energy, signed at Washington on August 16, 1957 (hereinafter referred to as the "Agreement for Cooperation");

Agree as follows:

ARTICLE I

Article II, paragraph B, of the Agreement for Cooperation is hereby amended by deleting the words "ten years" and substituting in lieu thereof the words "thirty years".

ARTICLE II

Article VI, paragraph A, of the Agreement for Cooperation is hereby amended to read as follows:

"Materials of interest in connection with defined research applications, including special nuclear materials (other than special nuclear materials to be used in the fueling of reactors and reactor experiments), source materials, by-product materials, other radioisotopes and stable isotopes may be sold or otherwise transferred in such quantities and under such terms and conditions as may be agreed when such materials are not available commercially."

ARTICLE III

Article VIII of the Agreement for Cooperation is hereby amended to read as follows:

"A. During the period of this Agreement, the United States Commission will transfer to the Government of Spain, under such terms and conditions as the Parties may agree, uranium enriched in the isotope U–235 for use in the fueling of defined research applications, including research reactors, materials testing reactors, reactor experiments and reactor prototypes as the Commission may agree to upon request of the Government of Spain, it being understood that the material will be delivered in accordance with contracts which set forth the agreed delivery schedules and other terms and conditions of supply.

"B. In addition, the Commission will sell to the Government of Spain all of Spain's requirements for enriched uranium for the power reactor program de-

scribed in Appendix A, it being understood that the material will be delivered in accordance with contracts which set forth the agreed delivery schedules and other terms and conditions of supply.

"C. The Commission is also prepared, to such extent and under such conditions as may be established by the Commission, to enter into contracts to provide after December 31, 1968, for the production and enrichment in facilities owned by the Commission of special nuclear material for the account of the Government of Spain for the uses specified in paragraphs A and B above.

"D. The net amount of enriched uranium transferred from the United States to the Government of Spain under paragraphs A, B, and C of this Article during the period of this Agreement for Cooperation shall not exceed 8500 kilograms of U–235.

This net amount shall be the difference between:

(1) The quantity of U–235 contained in enriched uranium transferred to the Government of Spain pursuant to said paragraphs A, B, and C, and

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

less the difference between:

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

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

except that if the difference between (3) and (4) is negative, it will not be considered.

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

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

"G. It is understood, unless otherwise agreed, that in order to assure the availability of the entire quantity of enriched uranium allocated hereunder for a particular reactor project described in Appendix A, it will be necessary for the construction of the project to be initiated in accordance with the schedule set forth in Appendix A and for the Government of Spain to execute a contract for that quantity in time to allow for the Commission to provide the material for the first fuel loading. It is also understood that if the Government of Spain desires to contract for less than the entire quantity of enriched uranium allocated for a particular project or terminates the supply contract after execution, the remaining quantity allocated for that project shall cease to be available and the maximum quantity of enriched uranium provided for in paragraph D of this Article shall be reduced accordingly, unless otherwise agreed.

"H. Within the limitations contained in paragraph D of this Article, the quantity of uranium enriched in the isotope U–235 transferred by the Commission under this Article and in the custody of the Government of Spain for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments, plus such additional quantity as, in the opinion of the Parties, is necessary for the efficient and continuous operation of such reactors or reactor experiments.

"I. It is agreed that when any special nuclear material received from the United States of America requires reprocessing, such reprocessing shall be performed at the discretion of the Commission in either Commission facilities or facilities acceptable to the Commission, on terms and conditions to be later agreed; and it is understood, except as may be otherwise agreed, that the form and con-

tent of any irradiated fuel elements shall not be altered after their removal from the reactor prior to delivery to the Commission or the facilities acceptable to the Commission for reprocessing.

"J. With respect to any special nuclear material not owned by the Government of the United States of America produced in reactors fueled with materials obtained from the United States of America which is in excess of the need of the Government of Spain for such materials in its program for the peaceful uses of atomic energy, the Government of the United States of America shall have and is hereby granted (a) a first option to purchase such material at prices then prevailing in the United States of America for special nuclear material produced in reactors which are fueled pursuant to the terms of an agreement for cooperation with the Government of the United States of America, and (b) the right to approve the transfer of such material to any other nation or a group of nations in the event the option to purchase is not exercised.

"K. Special nuclear material produced, as a result of irradiation processes, in any part of fuel leased hereunder shall be for the account of the Government of Spain and after reprocessing as provided in paragraph I of this Article shall be returned to the Government of Spain at which time title to such material shall be transferred to that Government, unless the Government of the United States of America shall exercise the option, which is hereby granted, to retain, with appropriate credit to the Government of Spain, any such special nuclear material which is in excess of the needs of Spain for such material in its program for the peaceful uses of atomic energy.

"L. Some atomic energy materials which the Government of Spain may request the Commission to provide in accordance with this Agreement are harmful to persons and property unless handled and used carefully. After delivery of such materials to the Government of Spain, the Government of Spain shall bear all responsibility, insofar as the Government of the United States of America is concerned, for the safe handling and use of such materials. With respect to any special nuclear materials or fuel elements which the Commission may, pursuant to this Agreement, lease to the Government of Spain or to any private individual or private organization under its jurisdiction, the Government of Spain shall indemnify and save harmless the Government of the United States of America against any and all liability (including third party liability) for any cause whatsoever arising out of the production or fabrication, the ownership, the lease, and the possession and use of such special nuclear materials or fuel elements after delivery by the Commission to the Government of Spain or to any authorized private individual or private organization under its jurisdiction."

ARTICLE IV

Article IX of the Agreement for Cooperation is hereby amended by deleting the words "lease, or sale and purchase," and substituting in lieu thereof the words "sale, lease, or, subject to required governmental authorizations, loan,".

ARTICLE V

Article X, paragraph B.3., of the Agreement for Cooperation is hereby amended by deleting the phrase "paragraph F (b)" and substituting in lieu thereof the phrase "paragraph J (b)".

ARTICLE VI

Article XII of the Agreement for Cooperation is hereby amended to read as follows:

"A. The Government of the United States of America and the Government of Spain, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency as soon as practicable, agree that the Agency will be requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement for Cooperation so that this responsibility will be assumed by the Agency at least six months prior to the start-up of the Zorita nuclear power station described in Appendix A or by December 31, 1966, whichever date is earlier. It is contemplated that the necessary arrangements will be effected without modification of this Agreement, through an Agreement to be negotiated between the Parties and the Agency which may include provisions for suspension of the safeguard rights accorded the Commission by Article X, paragraph B, of this Agreement during the time and to the extent that the Agency's safeguards apply to such materials and facilities.

"B. In the event the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement envisaged in Paragraph A of this

Article, either Party may, by notification, terminate this Agreement. Before either Party takes steps to terminate, the Parties will carefully consider the economic effect of any such termination. Neither Party will invoke its termination rights until the other Party has been given sufficient advance notice to permit arrangements by the Government of Spain, if it is the other Party, for an alternative source of power and to permit adjustment by the Government of the United States of America, if it is the other Party, of production schedules. In the event of termination by either Party, the Government of Spain shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear materials received pursuant to this Agreement and in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of Spain for such returned material at the current Commission's schedule of prices then in effect domestically."

ARTICLE VII

This Amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as hereby amended.

In Witness Whereof, the undersigned, duly authorized, have signed this Amendment.

Done at Washington, in duplicate, in the English and Spanish languages, both texts being equally authentic, this 29th day of November, 1965.

En Fe De Lo Cual, los abajo firmantes, debidamente authorizados, han firmado esta Enmienda.

Hecho en Washington, por duplicado, en idiomas inglés y español, siendo ambos textos igualmente auténticos hoy día 29 de noviembre de 1965.

For the Government of the United States of America:
Por El Gobierno de los Estados Unidos de America: JOHN M. LEDDY,
Assistant Secretary for European Affairs, Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of Spain:
Por El Gobierno de España:

MERRY DEL VAL,
Spanish Ambassador to the United States.

Certified to be a true copy:

WILLIAM L. YEOMANS,
Chief, European Branch, Division of International Affairs, U.S. Atomic Energy Commission.

APPENDIX A

Spanish enriched uranium power reactor program

Reactors (1)	Start of construction (2)	Total kilograms of U^{235} required [1] (3)
A. DON, 30 megawatts electrical	1965	366
B. Zorita, 153 megawatts electrical	1964	2,934
C. Nuclenor, 300 megawatts electrical	1966	4,930
Total		8,230

[1] As calculated in article VIII–D of the agreement for cooperation, as amended.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 9, 1965.

THE PRESIDENT.
The White House.

DEAR MR. PRESIDENT: The Atomic Energy Commission recommends that you approve the enclosed proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of Spain Concerning the Civil Uses of Atomic Energy," determine that its per-

formance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend and modify the agreement between the United States of America and the Government of Spain which was signed at Washington on August 16, 1957. The principal objective of the amendment is to provide fuel for the planned Spanish nuclear power program on a long-term basis.

Article I of the amendment would extend the expiration date of the agreement from 1968 to 1988.

Article II would permit materials of interest in connection with defined research applications, including special nuclear materials (other than special nuclear materials for fueling reactors and reactor experiments) to be made available on an "as may be agreed" basis when such material is not commercially available. A similar provision has been incorporated in several of our other agreements.

Under articles III–A and IV, enriched uranium and other materials could be transferred (including loaned, subject to required governmental authorization) for defined research applications, including research reactors, materials testing reactors, reactor experiments and reactor prototypes. The inclusion of the flexibility permitting loan is designed to reflect a proposed cooperative arrangement the Commission is now negotiating with Spain under which the initial enriched uranium and heavy water requirements for a proposed Spanish reactor prototype (the DON reactor) would be loaned to Spain for a 5-year period. The new language to be inserted in the agreement covering the possibility of a loan of materials is permissive and not obligatory in nature and it is understood that the actual conclusion of a loan arrangement with Spain will be contingent upon a final decision on the part of Spain to proceed with the project, the development of a suitable detailed exchange arrangement covering U.S. participation, and the receipt of the requisite congressional authorization.

Article III of the amendment would also permit the sale of enriched uranium to meet all of Spain's requirements for enriched uranium for the power reactor program described in the agreement. In addition, consistent with a recent change in the Atomic Energy Act, production or enrichment services would be provided after December 31, 1968, and would be subject to such terms and conditions as may be established by the Commission.

Under article III of the amendment, the quantities of enriched uranium that could be transferred to the Government of Spain to cover the estimated long-term enriched uranium fuel requirements of Spain would be increased to a maximum amount of 8,500 kilograms of U^{235}.

Further, article III would allow the Atomic Energy Commission, at its discretion, to make available to Spain uranium enriched to more than 20 percent in the isotope U^{235} when there is a technical or economic justification for such a transfer. This provision has been incorporated in our agreements with several other countries.

In keeping with the U.S. policy on safeguards, article VI would provide that the International Atomic Energy Agency will assume the responsibility for applying safeguards to materials and facilities subject to safeguards under the agreement for cooperation at least 6 months prior to the startup of the Spanish Zorita power reactor or by December 31, 1966, whichever date is earlier. This transfer of responsibility would be accomplished without further modification to the agreement by means of a trilateral agreement to be negotiated among the United States, Spain, and the International Atomic Energy Agency.

Following your determination, approval, and authorization, the proposed amendment will be formally executed by appropriate authorities of the Government of the United States of America and the Government of Spain. In compliance with section 123c of the Atomic Energy Act of 1954, as amended, the proposed amendment, together with your approval and determination, will then be submitted to the Joint Committee on Atomic Energy.

Respectfully yours,

(Signed) GLENN T. SEABORG,
Chairman.

THE WHITE HOUSE,
Washington, August 24, 1965.

Hon. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington.

DEAR DR. SEABORG: In accordance with section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me a proposed "Amendment to the Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Spain" and has recommended that I approve the proposed amendment, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(*a*) Approve the proposed amendment and determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(*b*) Authorize the execution of the proposed amendment on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

B. GOVERNMENT OF SWITZERLAND

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., January 12, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

(*a*) An executed "Agreement for Cooperation Between the Government of the United States of America and the Government of Switzerland Concerning Civil Uses of Atomic Energy";

(*b*) A copy of the letter from the Commission to the President recommending approval of the agreement; and

(*c*) A copy of a letter from the President to the Commission containing his determination that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and approving the agreement and authorizing its execution.

The agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would supersede the Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Switzerland, signed at Washington on June 21, 1956, and amended on April 24, 1959, and June 11, 1960. As we reported to the Joint Committee on July 14, 1965, the 1955 research agreement with Switzerland was allowed to expire since cooperation could be continued under the 1956 power agreement.

The Government of Switzerland has been desirous for some time of receiving from the Commission a general assurance regarding the availability of enriched fuel for their long-term nuclear energy program. Accordingly, the agreement would have a duration of 30 years and would provide for the transfer of an increased quantity of U^{235} to meet the needs of both the long-term program and of miscellaneous research and development projects.

Article VI of the new agreement implements the provisions of the private ownership legislation by providing a framework within which private persons in the two countries may be parties to transfers of special nuclear material. While the precise means by which these private transactions would be carried out have not yet been developed, the Commission retains the right to insure that they are made in accordance with applicable laws, regulations, policies, and license requirements of the United States. Proposed regulations for licensing the export of special nuclear material have been published for comment. Materials transferred under

article VI would be part of the total quantity of material available under the agreement.

Article VII would, consistent with the private ownership legislation, permit the Commission to perform uranium enrichment services after December 31, 1968, for the account of the Government of Switzerland. In addition, the net amount of U^{235} which could be transferred to Switzerland is increased to 30,000 kilograms, and uranium enriched to more than 20 percent in the isotope U^{235} could be made available when there is a technical or economic justification for such a transfer. In keeping with stated Commission policy, article VII also includes language which assures the comparability of domestic and foreign prices for enriched uranium and services performed, as well as of the advance notice required for delivery.

Article IX contains the peaceful uses guarantees of the Government of Switzerland and the Government of the United States. The U.S. guarantee would extend to equipment and devices transferred to the Government of the United States, to special nuclear material produced in U.S.-fueled reactors which is in excess of Switzerland's needs and which the United States decides to purchase, and to special nuclear material produced in U.S.-leased fuel which the United States elects to retain after reprocessing, or alternatively, to equivalent amounts of such purchased or retained material.

Article XI provides that the Government of the United States of America and the Government of Switzerland will promptly request the International Atomic Energy Agency to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the agreement. This transfer of responsibility to the Agency would be accomplished without amendment to the agreement by means of a trilateral agreement to be negotiated by the United States, Switzerland, and the IAEA.

The agreement will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of the agreement.

Cordially,

(Signed) GLENN T. SEABORG,
Chairman.

AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF SWITZERLAND CONCERNING CIVIL USES OF ATOMIC ENERGY

Whereas the Government of the United States of America and the Government of Switzerland signed an "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Switzerland" on June 21, 1956, which was amended by the Agreement signed on April 24, 1959, and the Agreement signed on June 11, 1960; and

Whereas the Government of the United States of America and the Government of Switzerland desire to pursue a research and development program looking toward the realization of peaceful and humanitarian uses of atomic energy, including the design, construction, and operation of power-producing reactors and research reactors, and the exchange of information relating to the development of other peaceful uses of atomic energy; and

Whereas the Government of the United States of America and the Government of Switzerland are desirous of entering into this Agreement to cooperate with each other to attain the above objectives; and

Whereas the Parties desire this Agreement to supersede the "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Switzerland", signed on June 21, 1956, as amended;

The Parties agree as follows:

ARTICLE I

A. The "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Switzerland", signed on June 21, 1956, as amended, is superseded on the date this Agreement enters into force.

B. This Agreement shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Agreement and shall remain in force for a period of thirty (30) years.

ARTICLE II

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

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

C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate because the information is privately owned or has been received from another Government.

ARTICLE III

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

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

(2) Health and safety problems related to the operation and use of the types of reactors listed in subparagraph (1) above; and

(3) The use of radioactive isotopes and radiation in physical and biological research, medical therapy, agriculture, and industry.

B. Agreed classification, patent, and security policies and practices shall continue to be maintained with respect to all classified information (including any inventions or discoveries employing such information), materials, equipment, and devices which have been exchanged under the superseded Agreement. The Parties intend to consult with each other to review the extent to which the agreed classification, patent, and security policies and practices referred to above continue to be appropriate and applicable.

ARTICLE IV

A. Materials of interest in connection with the subjects of agreed exchange of information, as provided in Article III and subject to the provisions of Article II, including source materials, special nuclear materials, by-product materials, other radioisotopes, and stable isotopes, may be transferred for definite application other than fueling reactors and reactor experiments in such quantities and under such terms and conditions as may be agreed when such materials are not commercially available.

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

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

ARTICLE V

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

ARTICLE VI

It is contemplated that, as provided in this Article, authorized private individuals and private organizations as well as governmental bodies in either the United States of America or Switzerland may deal directly with authorized private individuals and private organizations as well as governmental bodies in the other country. Accordingly, in connection with the subjects of agreed exchange of information as provided in Article III, it is understood that either Party and authorized persons under its jurisdiction may make arrangements to transfer and export materials, including special nuclear material, and equipment and devices to, and to perform services for, the other Party and authorized persons under its jurisdiction. Such arrangements shall be subject to:

(1) the limitations in Article II; and

(2) applicable laws, regulations, policies and license requirements of the Parties.

ARTICLE VII

A. During the period of this Agreement, the United States Commission will transfer to the Government of Switzerland, under such terms and conditions as the Parties may agree, uranium enriched in the isotope U–235 for use in the fueling of defined research applications, including research reactors, materials testing reactors, reactor experiments, and reactor prototypes, as the Commission may agree to upon request of the Government of Switzerland.

B. In addition, the United States Commission is prepared to sell to the Government of Switzerland all of Switzerland's requirements for uranium enriched in the isotope U–235 for use in the power reactor program described in the Appendix to this Agreement, which Appendix, subject to the quantity limitation established in paragraph E of this Article, may be amended from time to time by mutual consent without modification of this Agreement.

C. The United States Commission is also prepared, to such extent and under such conditions as it may establish, to enter into contracts to provide after December 31, 1968, for the production or enrichment, or both, in facilities owned by the Commission of special nuclear material for the account of the Government of Switzerland for the uses specified in paragraphs A and B above.

D. With respect to transfers of uranium enriched in the isotope U–235 provided for in paragraphs A, B, and C of this Article, it is understood that:

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

(2) prices for uranium enriched in the isotope U–235 sold or for services performed and the advance notice required for delivery will be those in effect for users in the United States. The United States Commission may agree to supply enriched uranium or perform enrichment services upon shorter notice, subject to assessment of such surcharge to the usual base price as the United States Commission may consider reasonable to cover abnormal production costs incurred by the United States Commission by reason of such shorter notice.

E. The adjusted net quantity of U–235 is enriched uranium transferred from the United States of America to the Government of Switzerland under paragraphs A, B, and C of this Article during the period of this Agreement for Cooperation shall not exceed 30,000 kilograms. The following method of computation shall be used in calculating transfers, within the ceiling quantity of 30,000 kilograms of U–235, made pursuant to said paragraphs A, B, and C of this Article:

From:

(1) The quantity of U–235 contained in enriched uranium transferred to the Government of Switzerland pursuant to said paragraphs A, B, and C, minus

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

Subtract:

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

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

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

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

H. It is understood, unless otherwise agreed, that in order to assure the availability of the entire quantity of enriched uranium allocated hereunder for a particular reactor project described in the Appendix, it will be necessary for the construction of the project to be initiated in accordance with the schedule set forth in the Appendix and for the Government of Switzerland to execute a contract for that quantity in time to allow for the United States Commission to provide the material for the first fuel loading. It is also understood that if the Government of Switzerland desires to contract for less than the entire quantity of enriched uranium allocated for a particular project or terminates the supply contract after execution, the remaining quantity allocated for that project shall cease to be available and the maximum adjusted net quantity of U–235 provided for in paragraph E of this Article shall be reduced accordingly, unless otherwise agreed.

I. Within the limitations contained in paragraph E of this Article, the quantity of uranium enriched in the isotope U–235 transferred by the United States Commission under this Article and in the custody of the Government of Switzerland for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments, plus such additional quantity as, in the opinion of the Parties, is necessary for the efficient and continuous operation of such reactors or reactor experiments.

J. It is agreed that when any special nuclear material received from the United States of America requires reprocessing, such reprocessing shall be performed at the discretion of the Commission in either Commission facilities or facilities acceptable to the Commission, on terms and conditions to be later agreed; and it is understood, except as may be otherwise agreed, that the form and content of any irradiated fuel elements shall not be altered after their removal from the reactor prior to delivery to the Commission or the facilities acceptable to the Commission for reprocessing.

K. With respect to any special nuclear material not owned by the Government of the United States of America produced in reactors fueled with materials obtained from the United States of America which is in excess of the need of the Government of Switzerland for such materials in its program for the peaceful uses of atomic energy, the Government of the United States of America shall have and is hereby granted (a) a first option to purchase such material at prices then prevailing in the United States of America for special nuclear material produced in reactors which are fueled pursuant to the terms of an agreement for cooperation with the Government of the United States of America, and (b) the right to approve the transfer of such material to any other nation or a group of nations in the event the option to purchase is not exercised.

L. Special nuclear material produced, as a result of irradiation processes, in any part of the fuel leased hereunder shall be for the account of the Government of Switzerland and, after reprocessing as provided in paragraph J of this Article, shall be returned to the Government of Switzerland, at which time title to such material shall be transferred to that Government, unless the Government of the United States of America shall exercise the option, which is hereby granted, to retain, with a credit to the Government of Switzerland based on the prices in the United States of America referred to in paragraph K of this Article any such special nuclear material which is in excess of the needs of Switzerland for such material in its program for the peaceful uses of atomic energy.

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

ARTICLE VIII

As may be necessary and as may be mutually agreed in connection with the subjects of agreed exchange of information as provided in Article III, and subject to the limitations set forth in Article II, and under such terms and conditions as may be mutually agreed, specified arrangements may be made from time to time between the Parties for the lease or sale of quantities of material, including heavy water and natural uranium, but not including special nuclear materials, greater than those required for research when such materials are not commercially available.

ARTICLE IX

A. The Government of Switzerland guarantees that:

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

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

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

B. The Government of the United States of America guarantees that no equipment or devices transferred from the Government of Switzerland to the Government of the United States of America or authorized persons under its jurisdiction pursuant to this Agreement or the superseded Agreement, no material purchased by the Government of the United States of America pursuant to paragraph K of Article VII of this Agreement, and no material retained by the Government of the United States of America pursuant to paragraph L of Article VII of this Agreement, or an equivalent amount of material of the same type as such purchased or retained material substituted therefor, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose.

ARTICLE X

A. The Government of the United States of America and the Government of Switzerland emphasize their common interest in assuring that any material,

equipment, or device made available to the Government of Switzerland pursuant to this Agreement or the superseded Agreement shall be used solely for civil purposes.

B. Except to the extent that the safeguards provided for in this Agreement are supplanted, by agreement of the Parties as provided in Article XI, by safeguards of the International Atomic Energy Agency, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights:

(1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design of any

(a) reactor and

(b) other equipment and devices, the design of which the United States Commission determines to be relevant to the effective application of safeguards,

which are to be made available to the Government of Switzerland or any person under its jurisdiction, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the United States Commission;

(2) With respect to any source or special nuclear material made available to the Government of Switzerland or any person under its jurisdiction by the Government of the United States of America or any person under its jurisdiction and any source or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment, or devices so made available:

(a) source material, special nuclear material, moderator material, or other material designated by the United States Commission,

(b) reactors,

(c) any other equipment or device designated by the United States Commission as an item to be made available on the conditions that the provisions of this subparagraph B (2) will apply,

(i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials; and

(ii) to require that any such material in the custody of the Government of Switzerland or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guaranties set forth in Article IX;

(3) To require the deposit in storage facilities designated by the United States Commission of any of the special nuclear material referred to in subparagraph B(2) of this Article which is not currently utilized for civil purposes in Switzerland and which is not purchased or retained by the Government of the United States of America pursuant to Article VII of this Agreement, transferred pursuant to Article VII, paragraph K(b), or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties;

(4) To designate, after consultation with the Government of Switzerland, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of Switzerland, shall have access in Switzerland to all places and data necessary to account for the source and special nuclear materials which are subject to subparagraph B(2) of this Article, to determine whether there is compliance with this Agreement, and to make such independent measurements as may be deemed necessary;

(5) In the event of non-compliance with the provisions of this Article or the guaranties set forth in Article IX and the failure of the Government of Switzerland to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment, and devices referred to in subparagraph B(2) of this Article;

(6) To consult with the Government of Switzerland in the matter of health and safety.

C. The Government of Switzerland undertakes to facilitate the application of the safeguards provided for in this Article.

ARTICLE XI

A. The Government of the United States of America and the Government of Switzerland, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency, agree that the Agency will be

promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement. It is contemplated that the necessary arrangements will be effected without modification of this Agreement through an agreement to be negotiated between the Parties and the Agency which may include provisions for suspension of the safeguard rights accorded to the United States Commission by Article X of this Agreement, during the time and to the extent that the Agency's safeguards apply to such materials and facilities.

B. In the event the Parties do not reach mutually satisfactory agreement on the terms of the trilateral arrangement envisaged in paragraph A of this Article, either Party may, by notification, terminate this Agreement. Before either Party takes steps to terminate this Agreement, the Parties will carefully consider the economic effects of any such termination. Neither Party will invoke its termination rights until the other Party has been given sufficient advance notice to permit arrangements by the Government of Switzerland, if it is the other Party, for an alternative of source of power and to permit adjustments by the Government of the United States of America, if it is the other Party, of production schedules. In the event of termination by either Party, the Government of Switzerland shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to this Agreement and still in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of Switzerland for sold material so returned at the United States Commission's schedule of prices then in effect domestically.

ARTICLE XII

The rights and obligations of the Parties provided for under this Agreement shall extend to cooperative activities initiated under the superseded Agreement, including, but not limited to, material, equipment, devices, and information transferred thereunder, to the extent applicable.

ARTICLE XIII

For the purposes of this Agreement:

A. "United States Commission" or "Commission" means the United States Atomic Energy Commission.

B. "Parties" means the Government of the United States of America, including the United States Commission on behalf of the Government of the United States of America, and the Government of Switzerland, including the Office of the Federal Delegate for Atomic Energy Questions on behalf of the Government of Switzerland. "Party" means one of the above "Parties".

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

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

E. "Equipment and devices" and "equipment or device" means any instrument, apparatus, or facility and includes any facility, except an atomic weapon, capable of making use of or producing special nuclear material, and component parts thereof.

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

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

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

I. "Source material" means (1) uranium, thorium, or any other material which is determined by the United States Commission or the Government of Switzerland to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the United States Commission or the Government of Switzerland may determine from time to time.

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

K. "Superseded Agreement" means the Agreement signed by the Parties on June 21, 1956, as amended by the Agreement signed on April 24, 1959, and the Agreement signed on June 11, 1960.

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

In Witness Whereof, the undersigned, duly authorized, have signed this Agreement.

Done at Washington in duplicate, in the English and French languages, both equally authentic, this 30th day of December, 1965.

En Foi de Quoi, les soussignés, dûment autorisés à cet effet, ont signé le présent accord.

Fait à Washington en double exemplaire, en anglais et en français, les deux versions faisant également foi, le 30 décembre 1965.

For the Government of the United States of America:
Pour le Gouvernement des Etats-Unis d'Amerique:

WALTER J. STOESSEL,
Deputy Assistant Secretary of State for European Affairs,
Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of Switzerland:
Pour le Gouvernement Suisse:

ALFRED ZEHNDER,
Ambassador of Switzerland, Embassy of Switzerland.

Certified to be a true copy:

WILLIAM L. YEOMANS,
Chief, European Branch, Division of International Affairs, U.S. Atomic Energy Commission.

APPENDIX

Swiss enriched uranium power reactor program

Reactors	Start of construction	Total kilograms U–235 required [1]
(1)	(2)	(3)
A. NOK, 350 megawatts electric, pressurized water reactor (Beznau)	1965	7,560
B. Atom-Electra, 600 megawatts electric (Electrowatt)	1966	9,220
C. 100 megawatts electric	1967	970
D. Bernese, 300 megawatts electric (Muhleberg I)	1967	6,058
E. Bernese, 300 megawatts electric (Muhleberg II)	1970	5,160
Total		28,968

[1] As calculated in Article VII, paragraph E, of the Agreement for Cooperation.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., October 29, 1965.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: In accordance with section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission recommends that you approve the enclosed proposed "Agreement for Cooperation Between the Government of the United States of America and the Government of Switzerland Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and

security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would supersede the "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Switzerland," signed at Washington on June 21, 1956, as amended. The Agreement for Cooperation signed in 1955 covering a limited program of research was allowed to expire on July 17, 1965, inasmuch as the cooperative activities initiated under that agreement has been brought under the provisions of the existing power agreement.

The primary reasons for entering into a new agreement are (*a*) to provide the framework for assuring the long-term supply of enriched fuel required for the projected Swiss nuclear power program and (*b*) to implement provisions of the Atomic Energy Act of 1954, which were added by recent amendments, permitting the performance of uranium enrichment services by the Commission and the private ownership of special nuclear materials.

The proposed agreement, which would have a term of 30 years, would provide for the conduct of activities on an unclassified basis, in contrast to the existing agreement which permits the exchange of classified information.

Article VI of the new agreement would reflect the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Switzerland to be parties to arrangements for the transfer of special nuclear material. Previously, such transactions were confined to Governments. Arrangements made directly between private parties under the proposed article VI would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and Swiss Governments.

Article VII of the proposed agreement would permit the sale of enriched uranium required for the long-term Swiss power reactor program described in the appendix to the agreement and would increase the maximum quantity of U^{235} that could be transferred to Switzerland from the present limit of 500 kilograms to 30,000 kilograms.

Article VII would also permit the Commission to perform uranium enrichment services after December 31, 1968, for the account of the Government of Switzerland under terms and conditions which the Commission may establish. In addition, the Commission would be able, at its discretion, to make available to the Government of Switzerland uranium enriched to more than 20 percent in the isotope U^{235} when there is an economic or technical justification for such a transfer.

In keeping with stated Commission policy, article VII also includes language which assures the comparability of domestic and foreign prices for enriched uranium and services performed, as well as of the advance notice required for delivery.

Article IX would continue in effect the U.S. guarantee that no equipment or device transferred to the Government of the United States will be used for military purposes. The U.S. guarantee would also extend to (*a*) special nuclear material produced in U.S. fueled reactors which is in excess of Switzerland's needs and which the United States decides to purchase, and (*b*) special nuclear material produced in U.S. leased fuel which the United States elects to retain after reprocessing, or, alternatively, to equivalent amounts of such purchased or retained material.

In keeping with U.S. policy to arrive at explicit understandings with countries with which we have cooperative agreements as to the transfer of safeguards to the International Atomic Energy Agency, article XI of the proposed agreement provides that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the Agreement.

Following your determination, approval, and authorization, the proposed agreement will be formally executed by appropriate authorities of the Governments of the United States and Switzerland. In compliance with section 123c. of the Atomic Energy Act of 1954, as amended, the proposed agreement will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(Signed) GLENN T. SEABORG,
Chairman.

THE WHITE HOUSE,
Washington, December 22, 1965.

Hon. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington.

DEAR DR. SEABORG: In accordance with section 123–a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by a letter of October 29, 1965, a proposed "Agreement for Cooperation Between the Government of the United States of America and the Government of Switzerland Concerning Civil Uses of Atomic Energy," and has recommended that I approve the proposed agreement, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of section 123–b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(*a*) Approve the proposed agreement and determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America; and

(*b*) Authorize the execution of the proposed agreement on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

C. GOVERNMENT OF THE REPUBLIC OF INDONESIA

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., January 12, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter—

(*a*) An executed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of Indonesia Concerning the Civil Uses of Atomic Energy";

(*b*) A copy of a letter from the Commission to the President recommending approval of the amendment; and

(*c*) A copy of a letter from the President to the Commission containing his determination that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and approving the amendment and authorizing its execution.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend the life of the agreement for a period of 5 years. In addition, the proposed amendment would provide that arrangements be made for the International Atomic Energy Agency to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the agreement.

The amendment will enter into force when the two Governments have exchanged written notifications that their respective statutory and constitutional requirements have been fulfilled.

As you know, this agreement expired on September 20, 1965, and the Department of State received on that date a formal note from the Government of Indonesia recognizing the continuing effect of the safeguards provisions of the agreement for cooperation over any materials, equipment, or devices transferred under the agreement pending the coming into force of the amendment extending the agreement.

The agreement with Indonesia is a standard research-type agreement providing for such things as exchange of information, the lease of enriched uranium for use as fuel for research reactors, and the sale of research quantities of special nuclear materials for use in defined research projects related to the peaceful uses of atomic energy. The standard safeguard provisions contained in similar research-type bilateral agreements are included in the Indonesian bilateral agreement.

U.S. assistance to Indonesia under the agreement for cooperation has taken the form of the provision of generally available unclassified information in the peaceful uses of atomic energy for medicine, agriculture, biology, the training of a few Indonesian scientists in peaceful uses, the export of a 250-kilowatt Triga

research reactor, the necessary fuel therefor, and a grant of $350,000 to cover a portion of the reactor cost.

We do not anticipate any need to increase the limits on the amounts of material which may be transferred to Indonesia during the life of the agreement as extended by this amendment.

Cordially,

(Signed) GLENN T. SEABORG,
Chairman.

AMENDMENT TO AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE REPUBLIC OF INDONESIA CONCERNING CIVIL USES OF ATOMIC ENERGY

The Government of the United States of America and the Government of the Republic of Indonesia,

Desiring to amend the Agreement for Cooperation between the Government of the United States of America and the Government of the Republic of Indonesia Concerning Civil Uses of Atomic Energy, signed at Washington on June 8, 1960 (hereinafter referred to as the "Agreement for Cooperation");

Agree as follows:

ARTICLE I

Article X of the Agreement for Cooperation is amended to read as follows:

"1. The Government of the United States of America and the Government of the Republic of Indonesia, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency, agree that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement for Cooperation. It is agreed that the necessary arrangements will be effected without modification of this Agreement, through an agreement to be concluded between the Parties and Agency which may include provisions for suspension of the safeguard rights accorded the Commission by Article VIII, paragraph 3, of this Agreement during the time and to the extent that the Agency's safeguards apply to such materials and facilities.

"2. In the event the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement envisaged in paragraph 1 of this Article, either Party may by notification terminate this Agreement. In the event of termination by either Party, the Government of the Republic of Indonesia shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to this Agreement and in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of the Republic of Indonesia for such returned material at the Commission's schedule of prices then in effect domestically."

ARTICLE II

The first sentence of paragraph 1 of Article XI of the Agreement for Cooperation is amended by deleting the phrase "five years" and substituting in lieu thereof the phrase "ten years".

ARTICLE III

This Amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as hereby amended.

In Witness Whereof, the undersigned, duly authorized, have signed this Amendment.

Done at Washington, in duplicate, this twelfth day of January, 1966.

For the Government of the United States of America:

WILLIAM P. BUNDY,
Assistant Secretary Far Eastern Affairs, Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of the Republic of Indonesia:

LAMBERTUS N. PILAR,
Ambassador, Embassy of Indonesia.

Certified to be a true copy:

RICHARD V. WILLIT,
Division of International Affairs, U.S. Atomic Energy Commission.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., September 23, 1965.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: The Atomic Energy Commission recommends that you approve the enclosed proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of Indonesia Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission recommendation.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend the life of the agreement for a period of 5 years. In addition, the proposed amendment would provide that arrangements be made for the International Atomic Energy Agency to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the agreement. In every other respect, there is no proposed change in the basic agreement.

Following your determination, approval, and authorization, the proposed amendment will be formally executed by appropriate authorities of the Government of the United States of America and the Government of the Republic of Indonesia. In compliance with section 123c of the Atomic Energy Act of 1954, as amended, the proposed amendment will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

GERALD F. TAPE,
Acting Chairman.

THE WHITE HOUSE,
Washington, January 1, 1966.

Hon. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington.

DEAR DR. SEABORG: In accordance with section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by letter of September 23, 1965, a proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of Indonesia Concerning the Civil Uses of Atomic Energy," and has recommended that I approve the proposed amendment, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to provisions of section 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby—

(*a*) Approve the proposed amendment and determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(*b*) Authorize the execution of the proposed amendment on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

D. GOVERNMENT OF THE TURKISH REPUBLIC

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., May 3, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

(a) a copy of a proposed agreement amending the Agreement for Cooperation Between the Government of the United States of America and the Government of the Turkish Republic Concerning Civil Uses of Atomic

Energy, together with copies of proposed diplomatic notes which are to be considered as part of the amending agreement;

(b) a copy of a letter from the Commission to the President recommending approval of the amending agreement; and

(c) a copy of a letter from the President to the Commission containing his determination that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and approving the amending agreement and authorizing its execution.

The amending agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would revise and extend the Agreement between the United States of America and Turkey which was signed at Washington on June 10, 1955, as amended by Agreements signed at Washington on April 27, 1961, and June 3, 1965.

The amending agreement would extend the Agreement for five years, until June 9, 1971. The Government of the Turkish Republic has agreed to the transfer to the International Atomic Energy Agency of safeguards responsibilities for materials and facilities transferred under the Agreement for Cooperation. Agreement with respect to this transfer would be effected by Article V of the amending agreement, together with the diplomatic notes.

Article II of the proposed amending agreement would permit the transfer to Turkey of material enriched to more than 20% in the isotope U-235 when there is a technical or economic requirement for such a transfer. Article IV would reflect the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Turkey to be parties to arrangements for the transer of special nuclear material. Previously, such transactions were confined to Governments. Arrangements made directly between private parties under Article IV would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and Turkish Governments.

The amending agreement also includes several minor revisions. Article I would conform the fields of information exchange to our more current practice, while Article III would delete the now-obsolete requirement for the Turkish Government to retain title to enriched uranium it receives under the Agreement until such time as United States users may acquire title to such material. Article VII of the amendment would clarify Article IX of the Agreement for Cooperation by explicitly stating that the U.S. and Turkey "may" consult, not necessarily "will" consult, with each other concerning an additional agreement covering nuclear power production in Turkey.

The proposed amendment will enter into force when the two Governments have exchanged written notifications that their respective statutory and constitutional requirements have been fulfilled.

Cordially,

GLENN T. SEABORG, *Chairman.*

AMENDMENT TO AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE TURKISH REPUBLIC CONCERNING CIVIL USES OF ATOMIC ENERGY

The Government of the United States of America and the Government of the Turkish Republic,

Desiring to amend the Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of the Turkish Republic, signed at Washington on June 10, 1955 (hereinafter referred to as the "Agreement for Cooperation"), as amended by the Agreement signed at Washington on April 27, 1961, and the Agreement signed at Washington on June 3, 1965, and

Recognizing that, as the result of the consultations initiated in accordance with Article VI bis of the Agreement for Cooperation, the Government of the United States of America and the Government of the Turkish Republic have agreed to promptly request the International Atomic Energy Agency to assume responsibility for the application of safeguards to materials and facilities subject to safeguards under the Agreement for Cooperation,

Agree as follows:

ARTICLE I

Article I, Paragraph A of the Agreement for Cooperation, as amended, is amended to read as follows:

"A. Subject to the limitations of Article V, the Parties hereto will exchange scientific, technical, and economic information useful for research, training, and application in the following fields:

"1. design, construction, operation, and use of research reactors, materials testing reactors, and reactor experiments;

"2. the use of radioactive isotopes and source, special nuclear, or byproduct material in physical and biological research, medicine, agriculture, and industry; and the production of radioactive isotopes for such uses; and

"3. health and safety problems related to the foregoing."

ARTICLE II

Article II, Paragraph C of the Agreement for Cooperation, as amended, is amended to read as follows:

"C. The Commission may, upon request and in its discretion, make all or a portion of the foregoing special nuclear material available as uranium enriched to more than twenty percent (20%) by weight in the isotope U–235 when there is a technical or economic requirement for such a transfer for use in research reactors, materials testing reactors, and reactor experiments, each capable of operating with a fuel load not to exceed eight (8) kilograms of the isotope U–235 contained in such uranium."

ARTICLE III

Article II, Paragraph D of the Agreement for Cooperation, as amended, is deleted in its entirety; Paragraphs E through H are relettered as D through G.

ARTICLE IV

Article IV of the Agreement for Cooperation is amended to read as follows:

"With respect to the subjects of agreed exchange of information referred to in Article I, it is understood that either Party or authorized persons under its jurisdiction may make arrangements to transfer materials, including special nuclear material, and equipment and devices to, and to perform services for, authorized persons under the jurisdiction of the other. Likewise, authorized private persons under the jurisdiction of either Party may make such arrangements with the other Party. Such arrangements shall be subject to:

"1. the limitations applicable to transactions between the Parties under Article II;

"2. Article V; and

"3. applicable laws, regulations, and license requirements of the Parties and their policies with regard to transactions involving private persons."

ARTICLE V

Article VI bis of the Agreement for Cooperation, as amended, is amended to read as follows:

"ARTICLE VI BIS

"The Government of the United States of America and the Government of the Turkish Republic, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency, agree that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement. It is contemplated that the necessary arrangements will be effected without modification of this Agreement through an agreement to be negotiated between the Parties and the Agency which may include provisions for suspension of the safeguard rights accorded to the United States Commission by Article VI of this Agreement, as amended, during the time and to the extent that the Agency's safeguards as set forth in IAEA document InfCirc/66, and any revision thereof, apply to such materials and facilities."

ARTICLE VI

Article VIII of the Agreement for Cooperation, as amended, is amended by deleting the date "June 9, 1966" and inserting in lieu thereof the date "June 9, 1971".

ARTICLE VII

Article IX of the Agreement for Cooperation is amended by deleting the word "will" in the second sentence and inserting in lieu thereof the word "may".

ARTICLE VIII

This amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as hereby amended.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Amendment.

DONE at Washington, in duplicate, this [1] ____ day of _____, 1966.

For the Government of the United States of America:

DZ

DONOVAN Q. ZOOK,

Officer-in-Charge, Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

WLY

WILLIAM L. YEOMANS,

Assistant Director for Program Development and Liaison, Atomic Energy Commission.

For the Government of the Turkish Republic:

EKA

ERDIL K. AKAY,

First Secretary, Embassy of Turkey, Washington, D.C.

[Initialed on April 18, 1966]

TURKISH EMBASSY,
Washington, D.C., April __, 1966.

His Excellency DEAN RUSK,
Secretary of State,
Washington, D.C.

EXCELLENCY: I have the honor to refer to the Amendment to the Agreement for Cooperation between the Government of the Turkish Republic and the Government of the United States of America Concerning Civil Uses of Atomic Energy which is being signed today.

In connection with the Amendment to the Agreement for Cooperation, the Government of the Turkish Republic and the Government of the United States of America further agree as follows:

"In the event any of the Parties to the trilateral arrangement envisaged in Article VI bis of the Agreement for Cooperation, as amended, is unable to agree to the terms of that arrangement, either the Government of the Turkish Republic or the Government of the United States of America may, by notification, terminate the Agreement for Cooperation. In the event the Agreement for Cooperation should be so terminated by either Government, the Government of the Turkish Republic agrees that it shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to the Agreement for Cooperation still in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of the Turkish Republic for its interest in such material so returned at the United States Atomic Energy Commission's schedule of prices then in effect domestically."

[1] The proposed amendment to the agreement for cooperation between the United States and the Turkish Republic reprinted above, although initialed by the two Governments and approved by the President, was not at the time of its submission to the Joint Committee on Atomic Energy signed by the parties or dated. Subsequently the Joint Committee was furnished with copies of the fully executed amendment, signed on May 11, 1966 by Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, and Raymond A. Hare, Assistant Secretary, Bureau of Near Eastern and South Asian Affairs, U.S. Department of State, for the United States, and Turgut Menemencioglu, Ambassador for the Turkish Republic.

It would be appreciated if you would confirm the agreement of the Government of the United States of America to the foregoing.

Accept, Excellency, the renewed assurances of my highest consideration.

(Signature)——— ———,[2]
Ambassador of the Turkish Republic.

EKA
ERDIL K. AKAY,
First Secretary, Embassy of Turkey, Washington, D.C.

DZ
DONOVAN Q. ZOOK,
Officer-in-Charge, Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

WLY
WILLIAM L. YEOMANS,
Assistant Director for Program Development and Liaison Atomic Energy Commission.

[Initialed on April 18, 1966]

DEPARTMENT OF STATE,
Washington, April --, 1966.[2]

His Excellency TURGUT MENEMENCIOGLU,
Ambassador of the Turkish Republic.

EXCELLENCY: I have the honor to refer to your note of April --, 1966, which reads as follows:

"EXCELLENCY: I have the honor to refer to the Amendment to the Agreement for Cooperation between the Government of the Turkish Republic and the Government of the United States of America Concerning Civil Uses of Atomic Energy which is being signed today.

"In connection with the Amendment to the Agreement for Cooperation, the Government of the Turkish Republic and the Government of the United States of America further agree as follows:

In the event any of the Parties to the trilateral arrangement envisaged in Article VI bis of the Agreement for Cooperation, as amended, is unable to agree to the terms of that arrangement, either the Government of the Turkish Republic or the Government of the United States of America may, by notification, terminate the Agreement for Cooperation. In the event the Agreement for Cooperation should be so terminated by either Government, the Government of the Turkish Republic agrees that it shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to the Agreement for Cooperation still in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of the Turkish Republic for its interest in such material so returned at the United States Atomic Energy Commission's schedule of prices then in effect domestically.

"It would be appreciated if you would confirm the agreement of the Government of the United States of America to the foregoing.

"Accept, Excellency, the renewed assurances of my highest consideration."

I have the honor to confirm the agreement of the Government of the United States of America as requested.

Accept, Excellency, the renewed assurances of my highest consideration.

For the Secretary of State:

DZ
DONOVAN Q. ZOOK,
Officer-in-charge, Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

EKA
ERDIL K. AKAY,
First Secretary, Embassy of Turkey, Washington, D.C.

WLY
WILLIAM L. YOEMANS,
Assistant Director for Program Development and Liaison, Atomic Energy Commission.

[Initialed on April 18, 1966]

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[2] See footnote 1, p. 142

U.S. Atomic Energy Commission,
Washington, D.C., April 20, 1966.

The President,
The White House.

Dear Mr. President: The Atomic Energy Commission recommends that you approve the enclosed proposed agreement amending the Agreement for Cooperation Between the Government of the United States of America and the Government of the Turkish Republic Concerning Civil Uses of Atomic Energy, together with the enclosed proposed notes to be exchanged between the two Governments, which notes are to be considered as part of the proposed amending agreement, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed amending agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would revise and extend the Agreement between the United States of America and Turkey which was signed at Washington on June 10, 1955, as amended by Agreements signed at Washington on April 27, 1961, and June 3, 1965.

The proposed amending agreement would extend the Agreement for five years, until June 9, 1971. The Government of the Turkish Republic has agreed to the transfer to the International Atomic Energy Agency of safeguards responsibilities for materials and facilities transferred under the Agreement for Cooperation. Agreement with respect to this transfer would be effected by an article in the amendment, together with the enclosed notes.

Article II of the proposed amending agreement would permit the transfer to Turkey of material enriched to more than 20% in the isotope U–235 when there is a technical or economic requirement for such a transfer. Article IV would reflect the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Turkey to be parties to arrangements for the transfer of special nuclear material. Previously, such transactions were confined to Governments. Arrangements made directly between private parties under Article IV would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and Turkish Governments.

The amending agreement also includes several minor revisions. Article I would conform the fields of information exchange to our more current practice, while Article III would delete the now-obsolete requirement for the Turkish Government to retain title to enriched uranium it receives under the Agreement until such time as United States users may acquire title to such material. Article IX would be clarified by explicitly stating that the U.S. and Turkey "may" consult, not necessarily "will" consult, with each other concerning an additional agreement covering nuclear power production in Turkey.

Following your approval, determination, and authorization, the proposed amending agreement will be formally executed by appropriate authorities of the Government of the United States of America and the Government of the Turkish Republic. In compliance with Section 123c. of the Atomic Energy Act of 1954, as amended, the agreement will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(S) Glenn T. Seaborg, *Chairman.*

(Enclosures: (1) Proposed Agreement Amending the Agreement for Cooperation Between the Government of the United States of America and the Government of the Turkish Republic. (2) Proposed Notes.)

The White House,
Washington, April 22, 1966.

Hon. Glenn T. Seaborg,
U.S. Atomic Energy Commission,
Washington.

Dear Dr. Seaborg: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by letter dated April 20, 1966, a proposed agreement amending the Agreement for Cooperation Between the Government of the United States of America and

the Government of the Turkish Republic Concerning Civil Uses of Atomic Energy, together with proposed notes to be exchanged between the two Governments, which notes are to be considered as part of the proposed amending agreement, and has recommended that I approve the proposed amending agreement, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(a) approve the proposed amending agreement and determine that the performance of the Agreement as amended will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(b) authorize the execution of the proposed amending agreement on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

E. GOVERMENT OF THE UNITED KINGDOM

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 2, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

a. An executed "Amendment to the Agreement for Cooperation on the Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland";

b. An executed "Agreement for Cooperation in the Civil Power Applications of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland";

c. A copy of the letter from the Commission to the President recommending approval of the Amendment and the Agreement; and

d. A copy of the letter from the President to the Commission containing his determination that performance of the Amendment and the Agreement will promote and will not constitute an unreasonable risk to the common defense and security, and approving the Amendment and the Agreement and authorizing the execution of each.

The proposed Amendment which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend for a period of ten years the existing Agreement between the United States and the United Kingdom which was signed on June 15, 1955. The principal objective of the Amendment is to provide for the transfer of an additional 2,000 kilograms of U–235 from the United States for fueling reactors in the United Kingdom's civil research and development program.

Materials, equipment and devices transferred pursuant to the extended Agreement will continue to be subject to the guarantees in Article IX of the original Agreement that no such material, equipment, or devices will be utilized for military purposes.

The proposed new Agreement for Civil Power Applications which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would provide for the supply of up to 8,000 kilograms of U–235 for use in the United Kingdom's civil nuclear power program during the ten year term of the Agreement. The United Kingdom estimates that it will need this material to help meet its requirements for fueling its 8,000 megawatt nuclear power program which is planned for startup in the 1970–75 period.

In addition to providing for the sale of this material, Article IV of the proposed Agreement provides that prices for the enriched uranium and for services performed, as well as the advance notice required for delivery, will be those in effect at the time of delivery for users in the United States. The same Article would

permit the transfer to the United Kingdom of material enriched to more than 20% in the isotope U–235 when there is a technical or economic requirement for such a transfer. Article IV would also provide for "toll" enrichment of United Kingdom uranium in United States' facilities after December 31, 1968. Article VI reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and the United Kingdom to be parties to arrangements for the transfer of special nuclear material. Previously, such transfers were confined to Governments. In light of the possibility of toll enrichment, Article V provides for the calculation of the quantity of material transferred on the basis of the net adjusted formula.

The new Agreement contains our usual statutory guarantees that no material, equipment or devices transferred pursuant to the Agreement will be used for military purposes. It also provides that the International Atomic Energy Agency will be requested to assume responsibility for applying safeguards to the materials transferred under the Agreement. Either party may terminate the Agreement in the event that the parties do not reach agreement on the application of IAEA safeguards.

The Amendment and the new Agreement will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for entry into force.

Cordially,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosures: (1) Amendment to the Agreement for Cooperation on the Civil Uses of Atomic Energy with the Government of the United Kingdom. (2) Agreement for Cooperation in the Civil Power Applications of Atomic Energy with the Government of the United Kingdom. (3) Letter from the Commission to the President. (4) Letter from the President to the Commission.)

AMENDMENT TO AGREEMENT FOR COOPERATION ON THE CIVIL USES OF ATOMIC ENERGY BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

The Government of the United States of America (including the United States Atomic Energy Commission) and the Government of the United Kingdom of Great Britain and Northern Ireland, on its own behalf and on behalf of the United Kingdom Atomic Energy Authority;

Desiring to amend further and to extend the term of the Agreement for Cooperation on the Civil Uses of Atomic Energy (hereinafter referred to as the "Agreement for Cooperation") signed between them at Washington on June 15, 1955, as amended by the Notes signed October 20, 1955, and November 3, 1955, as amended by the Agreement signed at Washington on June 13, 1956, as modified by the Agreement signed at Washington on July 3, 1958, as amended by the Agreement signed at Washington on June 5, 1963, as amended by the Agreement signed at Washington on June 29, 1964, and as amended by the Agreement signed at Washington on July 15, 1965;

Have agreed as follows:

ARTICLE I

Article IV, Paragraph (d), of the Agreement for Cooperation, as amended, is modified by changing "400", which appears before the word "kilograms" in the first sentence thereof, to read "2400".

ARTICLE II

Article XI of the Agreement for Cooperation, as amended, is modified by changing the word "eleven", which appears before the word "years" at the end thereof, to read "twenty-one".

ARTICLE III

This Amendment, which shall be regarded as an integral part of the Agreement for Cooperation, shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied wlth all statutory and constitutional requirements for the entry into force of this Amendment and shall remain in force for the period of the Agreement for Cooperation, as hereby amended.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Amendment.

DONE at Washington this second day of June 1966, in two original texts.

For the Government of the United States of America:

J. ROBERT SCHAETZEL,
Deputy Assistant Secretary of State, Bureau of European Affairs, Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of the United Kingdom of Great Britain and Northern Ireland:

PATRICK DEAN,
United Kingdom, Ambassador to the United States.

AGREEMENT FOR COOPERATION IN THE CIVIL POWER APPLICATIONS OF ATOMIC ENERGY BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

The Government of the United States of America including the United States Atomic Energy Commission (hereinafter referred to as the United States) and the Government of the United Kingdom of Great Britain and Northern Ireland, on its own behalf and on behalf of the United Kingdom Atomic Energy Authority (hereinafter referred to as the United Kingdom);

Desiring to engage in cooperation in furthering the use of atomic energy in civil power applications;

Have agreed as follows:

ARTICLE I

Scope of Agreement

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

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

C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate because the information is privately owned or has been received from another Government.

ARTICLE II

Exchange of Information

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

ARTICLE III

Responsibility of Receiving Party

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

ARTICLE IV

Materials for Civil Power Applications

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

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

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

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

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

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

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

ARTICLE V

Quantity of Material Available for Transfers

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

From:

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

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

Subtract:

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

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

ARTICLE VI

Cooperation Between Persons Under the Jurisdiction of the Parties

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

ARTICLE VII

Application of Safeguards

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

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

ARTICLE VIII

Guarantees

The Parties guarantee that:

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

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

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

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

ARTICLE IX

Definitions

For the purpose of this Agreement:

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

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

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

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

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

ARTICLE X

Entry Into Force

This Agreement shall enter into force on the date on which each Government shall have received from the other Government written notification that is has complied with all statutory and constitutional requirements for the entry into force of the Agreement and shall remain in force for a period of ten years.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Agreement.

DONE at Washington this second day of June, 1966, in two original texts.

For the Government of the United States of America:

J. ROBERT SCHAETZEL,
Deputy Assistant Secretary of State, Bureau of European Affairs, Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of the United Kingdom of Great Britain and Northern Ireland:

PATRICK DEAN,
United Kingdom, Ambassador to the United States.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., May 27, 1966.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: The Atomic Energy Commission recommends that you approve (1) the enclosed "Amendment to the Agreement for Cooperation on the Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland" and (2) the enclosed "Agreement for Cooperation in the Civil Power Applications of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland," determine, with respect to each of them, that its performance will promote and will not constitute an unreasonable risk to the common defense and security; and authorize the execution of each. The Department of State supports the Commission's recommendation.

The proposed Amendment which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would extend for a period of ten years the existing Agreement between the United States and the United Kingdom which was signed on June 15, 1955. The principal objective of the Amendment is to provide for the transfer of an additional 2,000 kilograms of U–235 from the United States for fueling reactors in the United Kingdom's civil research and development program. It is expected that the United Kingdom will desire 93% enrichment for much of its uranium requirements under this Amendment.

Materials, equipment and devices transferred pursuant to the extended Agreement will continue to be subject to the guarantees in Article IX of the original Agreement that no such material, equipment, or devices will be utilized for military purposes.

The proposed new Agreement for Civil Power Applications which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would provide for the supply of up to 8,000 kilograms of U–235 for use in the United Kingdom's civil nuclear power program during the ten year term of the Agreement. The United Kingdom estimates that it will need this material to help meet its requirements for fueling its 8,000 megawatt nuclear power program which is planned for startup in the 1970–1975 period.

Article I of the proposed Agreement provides that Restricted Data shall not be communicated under the Agreement. Article IV contains a provision to assure comparability of domestic and foreign prices for United States enriched uranium and enrichment services. The same Article would permit the transfer to the United Kingdom of material enirched to more than 20% in the isotope U–235 when there is a technical or economic requirement for such a transfer. Article IV also contains the usual provision for "toll" enrichment of United Kingdom uranium in United States' facilities after December 31, 1968. Article

VI reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and the United Kingdom to be parties to arrangements for the transfer of special nuclear material. Previously, such transfers were confined to Governments.

The new Agreement contains our usual statutory guarantees that no material, equipment or devices transferred pursuant to the Agreement will be used for military purposes. It also provides that the International Atomic Energy Agency will be requested to assume responsibility for applying safeguards to the materials transferred under the Agreement. Either party may terminate the Agreement in the event that the parties do not reach agreement on the application of IAEA safeguards.

Following your determination, approval, and authorization, the proposed Amendment and new Agreement will be formally executed by appropriate authorities of the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland. In compliance with Section 123c of the Atomic Energy Act of 1954, as amended, the Amendment and the new Agreement, together with your approval and determination will then be submitted to the Joint Committee on Atomic Energy.

Respectfully yours,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosures: (1) Proposed Amendment to the Agreement for Cooperation on the Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland. (2) Proposed Agreement for Cooperation in the Civil Power Applications of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland.)

THE WHITE HOUSE,
Washington, June 2, 1966.

HON. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington.

DEAR DR. SEABORG: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by letter dated May 27, 1966, a proposed "Amendment to the Agreement for Cooperation on the Civil Uses of Atomic Energy Between the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland," and a proposed "Agreement for Cooperation in the Civil Power Applications of Atomic Energy Between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland," and has recommended that I approve the proposed Amendment and the proposed new Agreement, determine, with respect to each of them, that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize the execution of each.

Pursuant to the provisions of Section 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(a) Approve the proposed Amendment and the proposed new Agreement and determine that their performance will not constitute an unreasonable risk to the common defense and security of the United States of America;

(b) Authorize the execution of the proposed Amendment and the proposed new Agreement on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

F. GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES

U.S. Atomic Energy Commission,
Washington, D.C., June 24, 1966.

Hon. Chet Holifield,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

Dear Mr. Holifield: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

a. a proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning Civil Uses of Atomic Energy";

b. a copy of a letter from the Commission to the President recommending approval of the amendment; and

c. a copy of a letter from the President to the Commission containing his determination that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and approving the amendment and authorizing its execution.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, revises the Agreement for Cooperation between the United States of America and the Philippines which was signed on July 27, 1955, as amended by the agreements signed on June 11, 1960, and August 7, 1963.

The amendment would permit the transfer to the Philippines of material enriched to more than 20% in the isotope U–235 when there is a technical or economic justification for such a transfer. Article II of the proposed amendment reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and the Philippines to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under Article II would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and the Philippines. A similar provision has been incorporated in the agreements with Switzerland and Turkey.

Inasmuch as the transfer of highly enriched fuel would be permitted under the proposed amendment, comprehensive bilateral safeguards have also been included. The Philippine research reactor and fuel obtained from the United States, however, are under the safeguards of the International Atomic Energy Agency, as provided in the trilateral agreement among the United States, the Philippines, and the Agency, which came into effect on September 24, 1965. Accordingly, the bilateral safeguards would be suspended as long as the trilateral safeguards currently applied by the International Atomic Energy Agency remain in force; U.S. safeguards would be resumed, however, if for any reason Agency safeguards should cease to apply.

As a result of providing for the transfer of highly enriched fuel and the consequent comprehensive bilateral safeguards, certain standard provisions have been added in the proposed amendment with respect to reprocessing of any source or special nuclear material acquired from the United States (Article I.B.) and with respect to an option to the United States Government to retain or purchase special nuclear materials produced through the use of U.S.-supplied material (Article I.C.).

The amendment will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements to bring the amendment into force.

Cordially,

(S) Glenn T. Seaborg, *Chairman.*

Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning Civil Uses of Atomic Energy

The Government of the United States of America and the Government of the Republic of the Philippines,

Desiring to amend the Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning Civil Uses of Atomic Energy, signed at Washington on

July 27, 1955 (hereinafter referred to as the "Agreement for Cooperation"), as amended by the Agreement signed at Washington on June 11, 1960, and the Agreement signed at Washington on August 7, 1963,

Agree as follows:

ARTICLE I

A. Article II, Paragraph B, of the Agreement for Cooperation, as amended, is amended by adding at the end thereof the following new sentence: "The United States Commission, however, may, upon request, make available all or a portion of the enriched uranium supplied hereunder as material containing more than twenty per cent (20%) by weight of the isotope U–235 when there is a technical or economic justification for such a transfer."

B. Article II, Paragraph C, of the Agreement for Cooperation, as amended, is amended to read as follows:

"C. It is agreed that when any source or special nuclear material received from the United States of America requires reprocessing, such reprocessing shall be performed at the discretion of the Commission in either Commission facilities or facilities acceptable to the Commission, on terms and conditions to be later agreed; and it is understood, except as may be otherwise agreed, that the form and content of any irradiated fuel shall not be altered after its removal from the reactor and prior to delivery to the Commission or the facilities acceptable to the Commission for reprocessing."

C. Article II, as amended, is further amended by adding the following new paragraphs E and F:

"E. Special nuclear material produced in any part of fuel leased hereunder as a result of irradiation processes shall be for the account of the Government of the Republic of the Philippines and, after reprocessing as provided in paragraph C of this Article, shall be returned to the Government of the Republic of the Philippines, at which time title to such material shall be transferred to that Government, unless the Government of the United States of America shall exercise the option, which is hereby granted, to retain, with appropriate credit based on the prices in the United States of America referred to in paragraph F of this Article, to the Government of the Republic of the Philippines, any such special nuclear material which is in excess of the needs of the Republic of the Philippines for such material in its program for the peaceful uses of atomic energy.

"F. With respect to any special nuclear material not subject to the option referred to in paragraph E of this Article and produced in reactors fueled with materials obtained from the United States of America which is in excess of the need of the Republic of the Philippines for such material in its program for the peaceful uses of atomic energy, the Government of the United States of America shall have and is hereby granted (a) a first option to purchase such material at prices then prevailing in the United States of America for special nuclear material produced in reactors which are fueled pursuant to the terms of an Agreement for Cooperation with the Government of the United States of America, and (b) the right to approve the transfer of such material to any other nation or group of nations in the event the option to purchase is not exercised."

ARTICLE II

Article IV of the Agreement for Cooperation is amended to read as follows:

"With respect to the subjects of agreed exchange of information referred to in Article I, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other for the transfer of materials, including special nuclear material, and equipment and devices, and for the performance of services. Such arrangements shall be subject to:

(1) the limitations applicable to transactions between the Parties under Article II,

(2) Article V, and

(3) applicable laws, regulations, policies, and license requirements of the Parties."

ARTICLE III

Paragraphs A, B, and C of Article VI of the Agreement for Cooperation, as amended, are amended to read as follows:

"A. The Government of the United States of America and the Government of the Republic of the Philippines emphasize their common interest in assuring that any material, equipment, or device made available to the Government of

the Republic of the Philippines or any person under its jurisdiction pursuant to this Agreement shall be used solely for civil purposes.

"B. Except to the extent that the safeguards provided for in this Agreement are supplanted, by agreement of the Parties as provided in Article VII (A), by safeguards of the International Atomic Energy Agency, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights:

(1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design of any

(a) reactor, and

(b) other equipment and devices, the design of which the United States Commission determines to be relevant to the effective application of safeguards,

which are, or have been, made available to the Government of the Republic of the Philippines or any person under its jurisdiction under this Agreement, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the United States Commission;

(2) With respect to any source or special nuclear material made available under this Agreement to the Government of the Republic of the Philippines of any person under its jurisdiction by the Government of the United States of America or any person under its jurisdiction and any source or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment or devices so made available:

(a) source material, special nuclear material, moderator material, or other material designated by the United States Commission,

(b) reactors,

(c) any other equipment or device designated by the United States Commission as an item to be made available on the condition that the provisions of this subparagraph B(2) will apply,

(i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials; and

(ii) to require that any such material in the custody of the Government of the Republic of the Philippines or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guaranties set forth in Article VII;

(3) To require the deposit in storage facilities designated by the United States Commission of any of the special nuclear material referred to in subparagraph B(2) of this Article which is not currently utilized for civil purposes in the Philippines and which is not purchased or retained by the Government of the United States of America pursuant to Article II of this Agreement, transferred pursuant to Article II, paragraph F(b), or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties;

(4) To designate, after consultation with the Government of the Republic of the Philippines, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of the Republic of the Philippines, shall have access in the Philippines to all places and data necessary to account for the source and special nuclear materials which are subject to subparagraph B(2) of this Article, to determine whether there is compliance with this Agreement, and to make such independent measurements as may be deemed necessary;

(5) In the event of non-compliance with the provisions of this Article or the guaranties set forth in Article VII and the failure of the Government of the Republic of the Philippines to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment, and devices referred to in subparagraph B(2) of this Article;

(6) To consult with the Government of the Republic of the Philippines in the matter of health and safety.

"C. The Government of the Republic of the Philippines underakes to facilitate the application of the safeguards provided for in this Article."

ARTICLE IV

Article VII, Paragraph B, of the Agreement for Cooperation is amended by adding the words, "or group of nations", following the word, "nation", wherever it appears.

ARTICLE V

Article VII (A) of the Agreement for Cooperation, as amended, is amended by deleting the reference, "paragraph C", and the commas preceding and following such reference.

ARTICLE VI

This Amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as amended.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Amendment.

DONE at Washington, in duplicate, this [1] _____ day of _____, 1966.

For the Government of the United States of America:

DZ
DONOVAN Q. ZOOK,
Director, Office of Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

BHT
BARBARA H. THOMAS,
Foreign Affairs Officer, Division of International Affairs, Atomic Energy Commission.

For the Government of the Republic of the Philippines:

JI
DR. JOSE F. IMPERIAL,
Chargé d'Affaires, Embassy of the Philippines.

[Initialed on June 23, 1966]

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 21, 1966.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: The Atomic Energy Commission recommends that you approve the enclosed proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would revise the Agreement for Cooperation between the United States of America and the Philippines which was signed at Washington on July 27, 1955, as amended by the Agreements signed on June 11, 1960, and August 7, 1963.

The proposed amendment would permit the transfer to the Philippines of material enriched to more than 20% in the isotope U–235 when there is a technical or economic justification for such a transfer. Article II of the proposed amendment reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and the Philippines to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under proposed Article II would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and the Philippines.

Inasmuch as the transfer of highly enriched fuel would be permitted under the proposed amendment, comprehensive bilateral safeguards have also been included.

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[1] The proposed amendment to the agreement for cooperation between the United States and the Republic of the Philippines reprinted above, although initialed by the two Governments and approved by the President, was not at the time of its submission to the Joint Committee on Atomic Energy signed by the parties or dated. Subsequently the Joint Committee was furnished with copies of the fully executed amendment, signed on June 27, 1966, by Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, and Samuel D. Berger, Acting Assistant Secretary of State for Far Eastern Affairs, U.S. Department of State, for the United States, and Jose F. Imperial, Charge d'Affairs *ad interim*, Embassy of the Philippines, for the Republic of the Philippines.

The Philippine research reactor and fuel obtained from the United States, however, are under the safeguards of the International Atomic Energy Agency, as provided in the trilateral agreement among the United States, the Philippines, and the Agency which came into effect on September 24, 1965. Accordingly, the bilateral safeguards in the proposed amendment would be suspended as long as the trilateral safeguards currently applied by the International Atomic Energy Agency remain in force; however, U.S. safeguards would be resumed if for any reason Agency safeguards should cease to apply.

As a result of providing for the transfer of highly enriched fuel and the consequent inclusion of comprehensive bilateral safeguards, the following standard provisions have been added in the proposed amendment:

a. reprocessing of source or special nuclear material acquired by the Philippines from the United States would be performed at the discretion of the United States Commission in either Commission facilities or facilities acceptable to the Commission (Article I.B.);

b. regarding U.S.-leased fuel, the United States may retain, after reprocessing, special nuclear material produced in such leased fuel which is in excess of the needs of the Philippines for its program in the peaceful uses of atomic energy (Article I.C.); and

c. regarding fuel otherwise transferred, the United States may purchase special nuclear material produced in such fuel which is in excess of the Philippines' needs and, if this option to purchase is not exercised, approval by the United States is required for the transfer of such material to another nation or group of nations (Article I.C.).

Articles IV and V of the proposed amendment include minor editorial revisions.

Following your determination, approval, and authorization, the proposed amendment will be formally executed by appropriate authorities of the Government of the United States of America and the Government of the Republic of the Philippines. In compliance with Section 123c of the Atomic Energy Act of 1954, as amended, it will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosure: Proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines.")

THE WHITE HOUSE,
Washington, June 24, 1966.

Hon. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington, D.C.

DEAR DR. SEABORG: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by a letter of June 21, 1966, a proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of the Philippines Concerning Civil Uses of Atomic Energy," and has recommended that I approve the proposed amendment, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of Section 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

a. approve the proposed amendment and determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America; and

b. authorize the execution of the proposed amendment on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

G. GOVERNMENT OF SWEDEN

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 3, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

a. An executed superseding "Agreement for Cooperation Concerning the Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Sweden";

b. A copy of the letter from the Commission to the President recommending approval of the Agreement; and

c. A copy of the letter from the President to the Commission containing his determination that performance of the Agreement will promote and will not constitute an unreasonable risk to the common defense and security, and approving the Amendment and authorizing its execution.

The Agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would supersede the research type Agreement between the United States of America and the Government of Sweden which was signed at Washington on January 18, 1956, as amended.

The primary reasons for entering into a power Agreement with the Government of Sweden are to provide the framework for assuring the long-term supply of enriched uranium fuel required for the projected Swedish nuclear power program and to provide for the transfer of safeguards responsibility to the IAEA, by incorporating in Article XI of the proposed Agreement the provision that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards in the Agreement.

The proposed Agreement, which would have a term of thirty years, would reflect changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear materials by enabling private parties in the United States and Sweden to be parties to arrangements for the transfer of special nuclear material. Arrangements made directly between private parties under the proposed Article VI would be undertaken pursuant to applicable laws, regulations, policies and license requirements of the Government of the United States and Sweden.

Article VII of the proposed Agreement would provide for the sale of enriched uranium required for the long-term Swedish power reactor program described in the Appendix to the Agreement and would increase the maximum quantity of U–235 that could be transferred to Sweden, either on the basis of sale or toll enrichment, from the present limit of 400 kilograms to 50,000 kilograms.

Performance by the Commission of uranium enrichment services after December 31, 1968, for the account of the Government of Sweden under conditions which the Commission may establish would be permitted by Article VII. In addition, the Commission would be able, at its discretion, to make available to the Government of Sweden uranium enriched to more than twenty percent in the isotope U–235 when there is an economic or technical justification for such a transfer.

Article IX of the proposed Agreement contains reciprocal guarantees by the Government of Sweden and the Government of the United States with respect to atomic weapons or other military use of materials, equipment and devices covered by the Agreement. The guarantee by the Government of the United States is similar to that contained in the Agreement for Cooperation between the United States and Switzerland and, insofar as materials are concerned, would extend to (a) special nuclear material not owned by the Government of the United States which is produced through the use of special nuclear materials obtained from the United States which is in excess of Swedish needs and which the United States decides to purchase and (b) special nuclear materials produced in United States-leased fuel which the United States elects to retain after it has been reprocessed, or alternatively, to equivalent amounts of such purchased or retained material.

The new Agreement will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for entry into force.

Cordially,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosures: (1) Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden (3). (2) Letter from

the Commission to the President (3). (3) Letter from the President to the Commission (3).)

AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF SWEDEN CONCERNING CIVIL USES OF ATOMIC ENERGY

Whereas the Government of the United States of America and the Government of Sweden signed an "Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden Concerning Civil Uses of Atomic Energy" on January 18, 1956 which was amended by the Agreement signed on August 3, 1956, the Agreement signed on April 25, 1958, and the Agreement signed on July 20, 1962; and

Whereas the Government of the United States of America and the Government of Sweden desire to pursue a research and development program looking toward the realization of peaceful and humanitarian uses of atomic energy, including the design, construction, and operation of power-producing reactors and research reactors, and the exchange of information relating to the development of other peaceful uses of atomic energy; and

Whereas the Government of the United States of America and the Government of Sweden are desirous of entering into this Agreement to cooperate with each other to attain the above objectives; and

Whereas the Parties desire this Agreement to supersede the "Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden Concerning Civil Uses of Atomic Energy" signed on January 18, 1956, as amended;

The Parties agree as follows:

ARTICLE I

The "Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden Concerning Civil Uses of Atomic Energy", signed on January 18, 1956, as amended, is superseded on the date this Agreement enters into force.

ARTICLE II

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

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

C. This Agreement shall not require the exchange of any information which the Parties are not permitted to communicate.

ARTICLE III

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

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

(2) Health and safety problems related to the operation and use of the types of reactors listed in subparagraph (1) above; and

(3) The use of radioactive isotopes and radiation in physical and biological research, medical therapy, agriculture, and industry.

ARTICLE IV

A. Materials of interest in connection with the subjects of agreed exchange of information, as provided in Article III and subject to the provisions of Article II, including special nuclear materials for purposes other than fueling reactors and reactor experiments, source materials, heavy water, by-product materials, other radioisotopes, and stable isotopes may be transferred between the Parties for

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

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

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

ARTICLE V

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

ARTICLE VI

With respect to the subjects of agreed exchange of information referred to in Article III, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other for the transfer of materials, including special nuclear material, and equipment and devices, and for the performance of services. Such arrangements shall be subject to the limitations in Articles II and VIII.

ARTICLE VII

A. During the period of this Agreement, the United States Commission will transfer to the Government of Sweden, under such terms and conditions as the Parties may agree, uranium enriched in the isotope U–235 for use in the fueling of defined research applications, including research reactors, materials testing reactors, reactor experiments, and reactor prototypes, as the Commission may agree to upon request of the Government of Sweden.

B. In addition, the United States Commission will sell to the Government of Sweden under such terms and conditions as the Parties may agree, all of Sweden's requirements for uranium enriched in the isotope U–235 for use in the power reactor program described in the Appendix to this Agreement, which Appendix, subject to the quantity limitation established in Article VIII, may be amended from time to time by mutual consent without modification of this Agreement.

C. The Commission may also transfer to the Government of Sweden, under such terms and conditions as the Parties may agree, special nuclear material for the performance in Sweden of conversion or fabrication services, or both, and for subsequent transfer to a nation or group of nations with which the Government of the United States of America has an Agreement for Cooperation within the scope of which such subsequent transfer falls.

D. The United States Commission is also prepared, to such extent and under such condition as it may establish, to enter into contracts to provide after December 31, 1968, for the production or enrichment, or both, in facilities owned by the Commission, of special nuclear material for the account of the Government of Sweden for the uses specified in paragraphs A, B and C of this Article.

E. With respect to transfers of uranium enriched in the isotope U–235 provided for in paragraphs A, B, C and D of this Article, it is understood that:

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

(2) prices for uranium enriched in the isotope U–235 sold or for services performed and the advance notice required for delivery will be those in effect at the time of delivery for users in the United States. The United States Commission may agree to supply enriched uranium or perform enrichment services upon shorter notice, subject to assessment of such surcharge to the usual base price as the United States Commission may consider

reasonable to recover abnormal production costs incurred by the United States Commission by reason of such shorter notice.

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

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

H. It is understood, unless otherwise agreed, that in order to assure the availability of the entire quantity of enriched uranium allocated hereunder for a particular reactor project described in the Appendix, it will be necessary for the construction of the project to be initiated in accordance with the schedule set forth in the Appendix and for the Government of Sweden to execute a contract for that quantity in time to allow for the United States Commission to provide the material for the first fuel loading. It is also understood that if the Government of Sweden desires to contract for less than the entire quantity of enriched uranium allocated for a particular project or terminates the supply contract after execution, the remaining quantity allocated for that project shall cease to be available and the maximum adjusted net quantity of U–235 provided for in Article VIII shall be reduced accordingly, unless otherwise agreed.

I. Within the limitations contained in Article VIII, the quantity of uranium enriched in the isotope U–235 transferred by the United States Commission under this Article and in the custody of the Government of Sweden for the fueling of reactors or reactor experiments shall not at any time be in excess of the quantity thereof necessary for the loading of such reactors or reactor experiments, plus such additional quantity as, in the opinion of the Parties, is necessary for the efficient and continuous operation of such reactors or reactor experiments.

J. It is agreed that when any special nuclear material received from the United States of America requires reprocessing, such reprocessing shall be performed at the discretion of the Commission in either Commission facilities or facilities acceptable to the Commission, on terms and conditions to be later agreed; and it is understood, except as may be otherwise agreed, that the form and content of any irradiated fuel elements shall not be altered after their removal from the reactor prior to delivery to the Commission or the facilities acceptable to the Commission for reprocessing.

K. With respect to any special nuclear material not owned by the Government of the United States of America which is produced through the use of special nuclear materials obtained from the United States of America and which is in excess of the need of the Government of Sweden for such materials in its program for the peaceful uses of atomic energy, the Government of the United States of America shall have and is hereby granted (a) a first option to purchase such material at prices then prevailing in the United States of America for special nuclear material produced in reactors which are fueled pursuant to the terms of an Agreement for Cooperation with the Government of the United States of America, and (b) the right to approve the transfer of such material to any other nation or a group of nations in the event the option to purchase is not exercised.

L. Special nuclear material produced, as a result of irradiation processes, in any part of the fuel leased under this or the superseded Agreement shall be for the account of the Government of Sweden and, after reprocessing as provided in paragraph J of this Article, shall be returned to the Government of Sweden, at which time title to such material shall be transferred to that Government, unless the Government of the United States of America shall exercise the option, which is hereby granted, to retain, with a credit to the Government of Sweden based on the prices in the United States of America referred to in paragraph K of this Article, any such special nuclear material which is in excess of the needs of Sweden for such material in its program for the peaceful uses of atomic energy.

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

ARTICLE VIII

The adjusted net quantity of U–235 in enriched uranium transferred from the United States of America to Sweden under Articles IV, VI, or VII during the period of this Agreement for Cooperation, or under the superseded Agreement, shall not exceed in the aggregate 50,000 kilograms. The following method of computation shall be used in calculating transfers, within the ceiling quantity of kilograms of U–235, made under said Articles or the superseded Agreement:

From:

(1) The quantity of U–235 contained in enriched uranium transferred under said Articles or the superseded Agreement, minus

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

Subtract:

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

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

ARTICLE IX

A. The Government of Sweden guarantees that:

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

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

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

B. The Government of the United States of America guarantees that no equipment or devices transferred from the Government of Sweden to the Government of the United States of America or authorized persons under its jurisdiction pursuant to this Agreement or the superseded Agreement, no material purchased by the Government of the United States of America pursuant to paragraph K of Article VII of this Agreement, and no material retained by the Government of the United States of America pursuant to paragraph L of Article VII of this Agree-

ment, or an equivalent amount of material of the same type of such purchased or retained material substituted therefor, will be used for atomic weapons, or for research on or development of atomic weapons, or for any other military purpose.

ARTICLE X

A. The Government of the United States of America and the Government of Sweden emphasize their common interest in assuring that any material, equipment, or device made available to the Government of Sweden or any person under its jurisdiction pursuant to this Agreement, or the superseded Agreement, shall be used solely for civil purposes.

B. Except to the extent that the safeguards provided for in this Agreement are supplanted, by agreement of the Parties as provided in Article XI, by safeguards of the International Atomic Energy Agency, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights:

(1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design of any

(a) reactor, and

(b) other equipment and devices, the design of which the United States Commission determines to be relevant to the effective application of safeguards,

which are, or have been, made available to the Government of Sweden or any person under its jurisdiction under this or the superseded Agreement, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the United States Commission;

(2) With respect to any source or special nuclear material made available to the Government of Sweden or any person under its jurisdiction under this or the superseded Agreement, by the Government of the United States of America or any person under its jurisdiction and any source or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment or devices so made available:

(a) source material, special nuclear material, moderator material, or other material designated by the United States Commission,

(b) reactors,

(c) any other equipment or device designated by the United States Commission as an item to be made available on the conditions that the provisions of this subparagraph B(2) will apply,

(i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials; and

(ii) to require that any such material in the custody of the Government of Sweden or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guaranties set forth in Article IX;

(3) To require the deposit in storage facilities designated by the United States Commission of any of the special nuclear material referred to in subparagraph B (2) of this Article which is not currently utilized for civil purposes in Sweden and which is not purchased or retained by the Government of the United States of America pursuant to Article VII of this Agreement, transferred pursuant to Article VII, paragraph K (b), or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties;

(4) To designate, after consultation with the Government of Sweden, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of Sweden, shall have access in Sweden to all places and data necessary to account for the source and special nuclear materials which are subject to subparagraph B (2) of this Article, to determine whether there is compliance with this Agreement, and to make such independent measurements as may be deemed necessary;

(5) In the event of non-compliance with the provisions of this Article or the guaranties set forth in Article IX and the failure of the Government of Sweden to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment, and devices referred to in subparagraph B(2) of this Article;

(6) To consult with the Government of Sweden in the matter of health and safety.

C. The Government of Sweden undertakes to facilitate the application of the safeguards provided for in this Article.

ARTICLE XI

A. The Government of the United States of America and the Government of Sweden, recognizing the desirability of making use of the facilities and services of the International Atomic Energy Agency, agree that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under this Agreement. It is contemplated that the necessary arrangements will be effected without modification of this Agreement through an agreement to be negotiated between the Parties and the Agency which may include provisions for suspension of the safeguard rights accorded to the United States Commission by Article X of this Agreement, during the time and to the extent that the Agency's safeguards apply to such materials and facilities.

B. In the event the Parties do not reach a mutually satisfactory agreement on the terms of the trilateral arrangement envisaged in paragraph A of this Article, either Party may, by notification, terminate this Agreement. Before either Party takes steps to terminate this Agreement, the Parties will carefully consider the economic effects of any such termination. Neither Party will invoke its termination rights until the other Party has been given sufficient advance notice to permit arrangements by the Government of Sweden, if it is the other Party, for an alternative source of power and to permit adjustment by the Government of the United States of America, if it is the other Party, of production schedules In the event of termination by either Party, the Government of Sweden shall, at the request of the Government of the United States of America, return to the Government of the United States of America all special nuclear material received pursuant to this Agreement or the superseded Agreement and still in its possession or in the possession of persons under its jurisdiction. The Government of the United States of America will compensate the Government of Sweden for its interest in such material so returned at the United States Commission's schedule of prices then in effect domestically.

ARTICLE XII

The rights and obligations of the Parties provided for under this Agreement shall extend, to the extent applicable, to cooperative activities initiated under the superseded Agreement, including, but not limited to, material, equipment, devices, and information transferred thereunder.

ARTICLE XIII

For the purposes of this Agreement:

A. "United States Commission" or "Commission" means the United States Atomic Energy Commission.

B. "Parties" means the Government of the United States of America, including the United States Commission on behalf of the Government of the United States of America, and the Government of Sweden. "Party" means one of the above "Parties".

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

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

E. "Equipment and devices" and "equipment or device" means any instrument, apparatus, or facility and includes any facility, except an atomic weapon, capable of making use of or producing special nuclear material, and component parts thereof.

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

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

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

I. "Source material" means (1) uranium, thorium, or any other material which is determined by the United States Commission or the Government of Sweden to be source material; or (2) ores containing one or more of the foregoing materials, in such concentration as the United States Commission or the Government of Sweden may determine from time to time.

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

K. "Superseded Agreement" means the Agreement signed by the Parties on January 18, 1956, as amended by the Agreement signed on August 3, 1956, the Agreement signed on April 25, 1958, and the Agreement signed on July 20, 1962.

L. "Safeguards" means a system of controls designed to assure that any materials, equipment, or devices committed to the peaceful use of atomic energy are not used to further any military purpose.

ARTICLE XIV

This Agreement shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Agreement and shall remain in force for a period of thirty (30) years.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Agreement.

DONE at Washington in duplicate this twenty-eighth day of July, 1966.

For the Government of the United States of America:

WALTER J. STOESSEL, Jr.,
Deputy Assistant Secretary of State for European Affairs, Department of State.

GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission.

For the Government of Sweden:

GÖRAN BUNDY,
Chargé d'Affaires ad interim.

APPENDIX

Sweden's nuclear power program

Reactor	Power MW net electrical	Start of construction	Criticality date	Total kgs U–235 required
A. Marviken Nuclear Power Station	200	1963	1968	2,932
B. Oskarshamm Nuclear Power Station	400	1966	1969	9,386
C. State Power Board, Nuclear Station II	500	1970	1974	10,396
D. Atomkraftkonsortiet Nuclear Station II	500	1971	1975	9,093
E. State Power Board, Nuclear Station III	500	1972	1976	9,596
F. Atomkraftkonsortiet Nuclear Station III	500	1973	1977	8,373
Total				49,776

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., July 5, 1966.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: In accordance with Section 123a. of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission recommends that you approve the enclosed proposed "Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and

security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed Agreement, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would supersede the "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Sweden," signed at Washington on January 18, 1956, as amended. This is a research-type Agreement.

The primary reasons for entering into a power Agreement are (a) to provide the framework for assuring the long-term supply of enriched uranium fuel required for the projected Swedish nuclear power program and (b) to implement provisions of the Atomic Energy Act of 1954, which were added by recent amendments, permitting the performance of uranium enrichment services by the Commission and the private ownership of special nuclear material. The proposed Agreement would have a term of thirty years.

Article VI of the new Agreement would reflect recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Sweden to be parties to arrangements for the transfer of special nuclear material. Previously, such transactions were confined to Governments. Arrangements made directly between private parties under the proposed Article VI would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the Governments of the United States and Sweden.

Article VII of the proposed Agreement would permit the sale of enriched uranium required for the long-term Swedish power reactor program described in the Appendix to the Agreement and would increase the maximum quantity of U–235 that could be transferred to Sweden from the present limit of 400 kilograms to 50,000 kilograms.

Article VII would also permit the Commission to perform uranium enrichment services after December 31, 1968, for the account of the Government of Sweden under conditions which the Commission may establish. In addition, the Commission would be able, at its discretion, to make available to the Government of Sweden uranium enriched to more than twenty percent in the isotope U–235 when there is an economic or technical justification for such a transfer.

In keeping with stated Commission policy, Article VII also includes language which assures the comparability of domestic and foreign prices for enriched uranium and services performed, as well as of the advance notice required for delivery.

Article IX of the proposed Agreement contains guarantees by the Government of Sweden against atomic weapons or other military use of materials, equipment and devices received from the United States. The proposed Agreement includes new language similar to that contained in the Agreement for Cooperation between the United States and Switzerland by which the United States makes similar guarantees. The United States' guarantee would extend to (a) special nuclear material produced through the use of special nuclear materials obtained from the United States which is in excess of Swedish needs and which the United States decides to purchase and (b) special nuclear material produced in United States-leased fuel which the United States elects to retain after it has been reprocessed, or, alternatively, to equivalent amounts of such purchased or retained material.

In keeping with United States' policy to arrive at explicit understandings with countries with which we have cooperative agreements as to the transfer of safeguards to the International Atomic Energy Agency, Article XI of the proposed Agreement provides that the Agency will be promptly requested to assume responsibility for applying safeguards to materials and facilities subject to safeguards under the Agreement.

Following your approval, determination, and authorization, the proposed Agreement will be formally executed by appropriate authorities of the Governments of the United States and Sweden, In compliance with Section 123.c of the Atomic Energy Act of 1954, as amended, the proposed Agreement will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosure: Agreement for Cooperation Between the Government of the United States of America and the Government of Sweden.)

THE WHITE HOUSE,
Washington, July 12, 1966.

Hon. GLENN T. SEABORG,
U.S. Atomic Energy Commission,
Washington.

DEAR DR. SEABORG: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me a proposed superseding "Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of Sweden" and has recommended that I approve the proposed Agreement, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(a) Approve the proposed Agreement, and determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(b) Authorize the execution of the proposed Agreement on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

H. GOVERNMENT OF ISRAEL

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 19, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

a. a proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of Israel Concerning Civil Uses of Atomic Energy";

b. a copy of a letter from the Commission to the President recommending approval of the amendment; and

c. a copy of a letter from the President to the Commission containing his determination that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and approving the amendment and authorizing its execution.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, revises the Agreement for Cooperation between the United States of America and Israel which was signed on July 12, 1955, as amended by the agreements signed on August 20, 1959, June 11, 1960, June 22, 1962, August 19, 1964, and April 2, 1965.

Article I of the proposed amendment would raise from ten to forty kilograms the net quanity of U–235 which may be transferred to Israel for fueling research reactors. Article I would also permit the transfer to Israel of material enriched to more than 20% in the isotope U–235 when there is a technical or economic justification for such a transfer.

Article II of the proposed amendment reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Israel to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under Article II would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and Israel. A similar provision has been incorporated in the Agreements with Switzerland, Turkey, the Philippines, and the United Kingdom.

Additionally, there is an editorial revision in Article I which would delete the now-obsolete provision that the Government of Israel retain title to enriched uranium until private users in the United States may acquire title to such material.

The amendment will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements to bring the amendment into force.

Cordially,

GLENN T. SEABORG, *Chairman.*

AMENDMENT TO AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF ISRAEL CONCERNING CIVIL USES OF ATOMIC ENERGY

The Government of the United States of America and the Government of Israel,

Desiring to amend the Agreement for Cooperation Between the Government of the United States of America and the Government of Israel Concerning Civil Uses of Atomic Energy signed at Washington on July 12, 1955 (hereinafter referred to as the "Agreement for Cooperation"), as amended by the Agreements signed at Washington on August 20, 1959, June 11, 1960, June 22, 1962, August 19, 1964, and April 2, 1965,

Agree as follows:

ARTICLE I

A. Paragraph A of Article II of the Agreement for Cooperation, as amended, is amended by deleting the number, "ten (10)", which appears before the word, "kilograms", in the proviso to the first sentence thereof, and substituting in lieu thereof the number, "forty (40)".

B. Paragraph C of Article II of the Agreement for Cooperation, as amended, is amended to read as follows:

"C. The Commission may, upon request and in its discretion, make all or a portion of the foregoing special nuclear material available as uranium enriched to more than twenty percent (20%) by weight in the isotope U–235 when there is a technical or economic justification for such a transfer for use in research reactors, materials testing reactors, and reactor experiments, each capable of operating with a fuel load not to exceed eight (8) kilograms of the isotope U–235 contained in such uranium."

C. Paragraph D of Article II of the Agreement for Cooperation, as amended, is deleted in its entirety; paragraphs E, F, G, and H of said Article are, respectively, relettered as paragraphs D, E, F, and G.

ARTICLE II

Article IV of the Agreement for Cooperation is amended to read as follows:

"With respect to the subjects of agreed exchange of information referred to in Article I, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other for the transfer of materials, including special nuclear material, and equipment and devices, and for the performance of services. Such arrangements shall be subject to:

(a) the limitations applicable to transactions between the Parties under Article II,

(b) Article V, and

(c) applicable laws, regulations, policies, and license requirements of the Parties."

ARTICLE III

This Amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as amended.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Amendment.

DONE at Washington, in duplicate, this[1] _____ day of _____, 1966.

For the Government of the United States of America:

DZ
DONOVAN Q. ZOOK,
Director, Office of Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

BHT
BARBARA H. THOMAS,
Foreign Affairs Officer, Division of International Affairs, U.S. Atomic Energy Commission.

For the Government of Israel:

JE
JOSEPH EYAL,
Attaché, Embassy of Israel.

[Initialed on August 12, 1966]

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 12, 1966.

THE PRESIDENT,
The White House.

DEAR MR. PRESIDENT: The Atomic Energy Commission recommends that you approve the enclosed proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of Israel Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would revise the Agreement for Cooperation between the United States of America and Israel which was signed at Washington on July 12, 1955, as amended by the Agreements signed on August 20, 1959, June 11, 1960, June 22, 1962, August 19, 1964, and April 2, 1965.

Article I of the proposed amendment would raise from ten to forty kilograms the net quantity of U–235 which may be transferred to Israel for fueling research reactors. In addition, Article I of the proposed amendment would permit the transfer to Israel of material enriched to more than 20% in the isotope U–235 when there is a technical or economic justification for such a transfer. These changes are proposed in order to meet Israel's plans for the future operation of its research reactor.

Article II of the proposed amendment would reflect the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and Israel to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under proposed Article II would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and Israel.

Additionally, the amendment would also include in Article I an editorial revision which would delete the now-obsolete provision that the Government of Israel retain title to enriched uranium until private users in the United States may acquire title to such material.

Following your determination, approval, and authorization, the proposed amendment will be formally executed by appropriate authorities of the Government of the United States of America and the Government of Israel. In compliance

[1] The proposed amendment to the agreement for cooperation between the United States and the Government of Israel reprinted above, although initialed by the two Governments and approved by the President, was not at the time of its submission to the Joint Committee on Atomic Energy signed by the parties or dated. Subsequently the Joint Committee was furnished with copies of the fully executed amendment, signed on August 23, 1966, by Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, and Raymond A. Hare, Assistant Secretary of State for Near Eastern Affairs, U.S. Department of State, for the United States, and Ephraim Evron, Charge d'Affairs *ad interim*, Embassy of Israel, for the Government of Israel.

with Section 123c of the Atomic Energy Act of 1954, as amended, it will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosure: Proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of Israel.")

THE WHITE HOUSE,
Washington, August 17, 1966.

Hon. GLENN T. SEABORG,
Atomic Energy Commission,
Washington, D.C.

DEAR DR. SEABORG: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by letter dated August 12, 1966, a proposed Amendment to the Agreement for Cooperation between the Government of the United States of America and the Government of Israel Concerning the Civil Uses of Atomic Energy and has recommemded that I approve the proposed amendment, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(a) approve the proposed amendment and determine that the performance of the Agreement, as amended, will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(b) authorize the execution of the proposed amendment on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

I. GOVERNMENT OF THE REPUBLIC OF CHINA

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., August 23, 1966.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Pursuant to Section 123c of the Atomic Energy Act of 1954, as amended, there are submitted with this letter:

a. a proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of China Concerning the Civil Uses of Atomic Energy;

b. a copy of a letter from the Commission to the President recommending approval of the amendment; and

c. a copy of a letter from the President to the Commission containing his determination that its performance will promote and will not not constitute an unreasonable risk to the common defense and security, and approving the amendment and authorizing its execution.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, revises the Agreement for Cooperation between the United States of America and China which was signed on July 18, 1955, as amended by the agreements signed on December 8, 1958, June 11, 1960, May 31, 1962, and June 8, 1964.

Article II of the proposed amendment would raise from six to eight kilograms the quantity of U–235 in enriched uranium which may be used for fueling research reactors in China at any time. The existing language of Article II in the agreement which provides for the transfer of an additional amount to permit the efficient and continuous operation of the reactor or reactors is being retained.

Article II would also permit the transfer to China of material enriched to more than 20% in the isotope U–235 when there is a technical or economic justification for such a transfer.

Article III of the proposed amendment reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and China to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under proposed Article III would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and China. A similar provision has been incorporated in the agreements with Switzerland, the Philippines, Turkey, and the U.K., and the proposed Swedish agreement and Israeli amendment.

Inasmuch as the transfer of highly enriched fuel would be permitted under the proposed amendment, comprehensive bilateral safeguards have also been included. The Chinese research reactor and fuel obtained from the United States, however, are under the safeguards of the International Atomic Energy Agency, as provided in the trilateral agreement among the United States, China, and the Agency, which entered into force on October 29, 1965. Accordingly, as with the present bilateral safeguards, the comprehensive bilateral safeguards would be suspended as long as the trilateral safeguards remain in force. United States safeguards would be resumed, however, if for any reason Agency safeguards should cease to apply.

Additionally, the formulation in Article I respecting information exchange has been brought into conformity with currently used language, and redundant features of Paragraph A of Article II have been eliminated. Articles V and VI contain minor editorial revisions.

The amendment will enter into force on the day on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements to bring the amendment into force.

Cordially,

(S) GLENN T. SEABORG, *Chairman.*

(Enclosures: (1) Amendment to Agreement for Cooperation with the Government of the Republic of China (3). (2) Letter from the Commission to the President (3). (3) Letter from the President to the Commission (3).)

AMENDMENT TO AGREEMENT FOR COOPERATION BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA AND THE GOVERNMENT OF THE REPUBLIC OF CHINA CONCERNING CIVIL USES OF ATOMIC ENERGY

The Government of the United States of America and the Government of the Republic of China,

Desiring to amend the Agreement for Cooperation Concerning Civil Uses of Atomic Energy Between the Government of the United States of America and the Government of the Republic of China, signed at Washington on July 18, 1955 (hereinafter referred to as the "Agreement for Cooperation"), as amended by the Agreements signed at Washington on December 8, 1958, June 11, 1960, May 31, 1962, and June 8, 1964,

Agree as follows:

ARTICLE I

Article I, Paragraph A of the Agreement for Cooperation, as amended, is amended to read as follows:

"A. Subject to the limitations of Article V, the Parties hereto will exchange information in the following fields:

1. design, construction, operation, and use of research reactors, materials testing reactors, and reactor experiments;

2. the use of radioactive isotopes and source, special nuclear, or byproduct material in physical and biological research, medical therapy, agriculture, and industry; and

3. health and safety problems related to the foregoing."

ARTICLE II

A. Article II, Paragraph A of the Agreement for Cooperation, as amended, is amended to read as follows:

"A. The Commission will transfer to the Government of the Republic of China uranium enriched in the isotope U–235, subject to the terms and conditions herein, as may be required as initial and replacement fuel in the operation of research reactors, materials testing reactors, and reactor experiments which the

Government of the Republic of China, in consultation with the Commission, decides to construct or operate or decides to authorize private individuals and private organizations under its jurisdiction to construct or operate."

B. Article II, Paragraph B of the Agreement for Cooperation, as amended, is amended as follows:

1. The number, "six (6)", is deleted wherever it appears and the number, "eight (8)", is substituted in lieu thereof.

2. The last sentence thereof is deleted and the following is substituted in lieu thereof: "The Commission may, however, upon request, make all or a portion of the foregoing special nuclear material available as uranium enriched to more than twenty percent (20%) by weight in the isotope U–235 when there is a technical or economic justification for such a transfer for use in research reactors, materials testing reactors, and reactor experiments, each capable of operating with a fuel load not to exceed eight (8) kilograms of the isotope U–235 contained in such uranium."

ARTICLE III

Article IV of the Agreement for Cooperation is amended to read as follows:

"With respect to the subjects of agreed exchange of information referred to in Article I, it is understood that arrangements may be made between either Party or authorized persons under its jurisdiction and authorized persons under the jurisdiction of the other for the transfer of materials, including special nuclear material, and equipment and devices, and for the performance of services. Such arrangements shall be subject to:

1. the limitations applicable to transactions between the Parties under Article II;

2. Article V; and

3. applicable laws, regulations, policies, and license requirements of the Parties."

ARTICLE IV

Paragraphs A, B, and C of Article VI of the Agreement for Cooperation, as amended, are amended to read as follows:

"A. The Government of the United States of America and the Government of the Republic of China emphasize their common interest in assuring that any material, equipment, or device made available to the Government of the Republic of China or any person under its jurisdiction pursuant to this Agreement shall be used solely for civil purposes.

"B. Except to the extent that the safeguards provided for in this Agreement are supplanted, by agreement of the Parties as provided in Article VII (A), by safeguards of the International Atomic Energy Agency, the Government of the United States of America, notwithstanding any other provisions of this Agreement, shall have the following rights:

(1) With the objective of assuring design and operation for civil purposes and permitting effective application of safeguards, to review the design of any

(a) reactor, and

(b) other equipment and devices, the design of which the Commission determines to be relevant to the effective application of safeguards,

which are, or have been, made available to the Government of the Republic of China or any person under its jurisdiction under this Agreement, or which are to use, fabricate, or process any of the following materials so made available: source material, special nuclear material, moderator material, or other material designated by the Commission;

(2) With respect to any source or special nuclear material made available under this Agreement to the Government of the Republic of China or any person under its jurisdiction by the Government of the United States of America or any person under its jurisdiction and any source or special nuclear material utilized in, recovered from, or produced as a result of the use of any of the following materials, equipment of devices so made available:

(a) source material, special nuclear material, moderator material, or other material designated by the Commission,

(b) reactors,

(c) any other equipment or device designated by the Commission as an item to be made available on the condition that the provisions of this subparagraph B(2) will apply,

(i) to require the maintenance and production of operating records and to request and receive reports for the purpose of assisting in ensuring accountability for such materials; and

(ii) to require that any such material in the custody of the Government of the Republic of China or any person under its jurisdiction be subject to all of the safeguards provided for in this Article and the guaranties set forth in Article VII;

(3) To require the deposit in storage facilities designated by the Commission of any of the special nuclear material referred to in subparagraph B(2) of this Article which is not currently utilized for civil purposes in the Republic of China and which is not retained or purchased by the Government of the United States of America pursuant to Paragraphs E or F, respectively, of Article II, or otherwise disposed of pursuant to an arrangement mutually acceptable to the Parties;

(4) To designate, after consultation with the Government of the Republic of China, personnel who, accompanied, if either Party so requests, by personnel designated by the Government of the Republic of China, shall have access in the Republic of China to all places and data necessary to account for the source and special nuclear materials which are subject to subparagraph B(2) of this Article, to determine whether there is compliance with this Agreement, and to make such independent measurements as may be deemed necessary;

(5) In the event of noncompliance with the provisions of this Article or the guaranties set forth in Article VII and the failure of the Government of the Republic of China to carry out the provisions of this Article within a reasonable time, to suspend or terminate this Agreement and to require the return of any materials, equipment, and devices referred to in subparagraph B (2) of this Article;

(6) To consult with the Government of the Republic of China in the matter of health and safety.

"C. The Government of the Republic of China undertakes to facilitate the application of the safeguards provided for in this Article."

ARTICLE V

Article VII, Paragraph B of the Agreement for Cooperation is amended by adding the words, "or group of nations", following the word, "nation", wherever it appears.

ARTICLE VI

Article VII (A) 1 of the Agreement for Cooperation, as amended, is amended by deleting the reference, "paragraph C", and the commas preceding and following such reference.

ARTICLE VII

This Amendment shall enter into force on the date on which each Government shall have received from the other Government written notification that it has complied with all statutory and constitutional requirements for the entry into force of such Amendment and shall remain in force for the period of the Agreement for Cooperation, as amended.

IN WITNESS WHEREOF, the undersigned, duly authorized, have signed this Amendment.

DONE at Washington, in duplicate, this [1] _____ day of _____, 1966.

For the Government of the United States of America:

DZ
DONOVAN Q. ZOOK,
Director, Office of Atomic Energy Affairs, International Scientific and Technological Affairs, Department of State.

BHT
BARBARA H. THOMAS,
Foreign Affairs Officer, Division of International Affairs, U.S. Atomic Energy Commission.

For the Government of the Republic of China:

MW
MARTIN WONG,
Economic Minister Counselor, Chinese Embassy, Washington, D.C.

[Initialed on August 17, 1966]

[1] The proposed amendment to the agreement for cooperation between the United States and the Republic of China reprinted above, although initialed by the two Governments and approved by the President, was not at the time of its submission to the Joint Committee on Atomic Energy signed by the parties or dated. Subsequently the Joint Committee was furnished with copies of the fully executed amendment, signed on August 25, 1966, by Glenn T. Seaborg, Chairman, U.S. Atomic Energy Commission, and William P. Bundy, Assistant Secretary of State for Far Eastern Affairs, U.S. Department of State, for the United States, and Chow Shu-Kai, Ambassador, for the Republic of China.

U.S. Atomic Energy Commission,
Washington, D.C., August 17, 1966.

The President,
The White House.

Dear Mr. President: The Atomic Energy Commission recommends that you approve the enclosed proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of China Concerning Civil Uses of Atomic Energy," determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution. The Department of State supports the Commission's recommendation.

The proposed amendment, which has been negotiated by the Atomic Energy Commission and the Department of State pursuant to the Atomic Energy Act of 1954, as amended, would revise the Agreement for Cooperation between the United States of America and China which was signed at Washington on July 18, 1955, as amended by the Agreements signed December 8, 1958, June 11, 1960, May 31, 1962, and June 8, 1964. The Agreement for Cooperation pertains to research in the peaceful uses of atomic energy, particularly through the utilization of research reactors. The agreement is scheduled to expire on July 17, 1974.

Article II of the proposed amendment to the agreement would raise from six to eight kilograms the net quantity of U-235 which may be transferred to China for fueling research reactors. In addition, Article II would permit the transfer to China of material enriched to more than 20% in the isotope U-235 when there is a technical or economic justification for such a transfer.

Article III of the proposed amendment reflects the recent changes in the Atomic Energy Act of 1954 permitting private ownership of special nuclear material by enabling private parties in the United States and China to be parties to arrangements for the transfer of special nuclear material. Previously, such arrangements were confined to governments. Arrangements made directly between private parties under proposed Article III would be undertaken pursuant to applicable laws, regulations, policies, and license requirements of the United States and China.

Inasmuch as the transfer of highly enriched fuel would be permitted under the proposed amendment, comprehensive bilateral safeguards have also been included. The Chinese research reactor and fuel obtained from the United States, however, are under the safeguards of the International Atomic Energy Agency, as provided in the trilateral agreement among the United States, China, and the Agency which came into effect on October 29, 1965. Accordingly, the bilateral safeguards in the proposed amendment would be suspended as long as the trilateral safeguards currently applied by the International Atomic Energy Agency remain in force; however, U.S. safeguards would be resumed if for any reason Agency safeguards should cease to apply.

The proposed amendment also includes several minor revisions. Article I would conform the fields of information exchange to our more current practice, while Paragraph A of Article II combines language presently in the agreement to eliminate unnecessary repetition. Articles V and VI of the proposed amendment include minor editorial revisions.

Following your determination, approval, and authorization, the proposed amendment will be formally executed by appropriate authorities of the Government of the United States of America and the Government of the Republic of China. In compliance with Section 123c of the Atomic Energy Act of 1954, as amended, it will then be placed before the Joint Committee on Atomic Energy.

Respectfully yours,

(S) Glenn T. Seaborg, *Chairman.*

(Enclosure: Proposed "Amendment to Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of China.")

The White House,
Washington, August 23, 1966.

Hon. Glenn T. Seaborg,
Atomic Energy Commission,
Washington.

Dear Dr. Seaborg: In accordance with Section 123a of the Atomic Energy Act of 1954, as amended, the Atomic Energy Commission has submitted to me by letter dated August 17, 1966, a proposed Amendment to the Agreement for Cooperation between the Government of the United States of America and the

Government of the Republic of China Concerning the Civil Uses of Atomic Energy and has recommended that I approve the proposed amendment, determine that its performance will promote and will not constitute an unreasonable risk to the common defense and security, and authorize its execution.

Pursuant to the provisions of 123b of the Atomic Energy Act of 1954, as amended, and upon the recommendation of the Atomic Energy Commission, I hereby:

(a) approve the proposed amendment and determine that the performance of the Agreement, as amended, will promote and will not constitute an unreasonable risk to the common defense and security of the United States of America;

(b) authorize the execution of the proposed amendment on behalf of the Government of the United States of America by appropriate authorities of the Department of State and the Atomic Energy Commission.

Sincerely,

LYNDON B. JOHNSON.

APPENDIX 2

NOTES EXCHANGED BY INDONESIA AND THE UNITED STATES CONCERNING CONTINUING EFFECT OF SAFEGUARDS AND GUARANTEE PROVISIONS OF EXPIRED AGREEMENT

DEPARTMENT OF STATE,
THE DIRECTOR, INTERNATIONAL SCIENTIFIC AND
TECHNOLOGICAL AFFAIRS,
February 9, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: When Mr. Palfrey and I appeared on January 27, 1966. before the Subcommittee on Agreements for Cooperation of the Joint Committee on Atomic Energy, Senator Gore said that the committee would like to make public copies of the notes between the United States and Indonesian Governments which were conveyed to the committee by the Department of State on October 28, 1965.[1]

Since the decision has been made by the President to proceed with the extension of the agreement with Indonesia which now lies before the Joint Committee under the statutory provision, there is no longer any necessity to retain the confidential status of these notes.

Sincerely,

(Signed) HERMAN POLLOCK, *Acting.*

WASHINGTON, D.C., *September 20, 1965.*

The Indonesian Ambassador presents his compliments to His Excellency the Secretary of State and has the honor to refer to the proposed amendment to the Agreement for Cooperation Between the Republic of Indonesia and the Government of the United States of America Concerning Civil Uses of Atomic Energy signed on June 8, 1960.

The Ambassador is informed that the United States statutory requirements set forth in section 123c of the U.S. Atomic Energy Act of 1954, as amended, to the effect that the proposed amendment to the agreement must lie before the U.S. Congress Joint Committee on Atomic Energy for a period of 30 days will not have been satisfied by September 20, 1965, the date on which the agreement to be amended would expire.

The Indonesian Government, however, recognizes the continuing effect of the safeguards and the guaranteed provisions of the agreement for cooperation of June 8, 1960, and states that it will hold any materials, equipment, and devices it has received under the agreement and the subsidiary arrangements thereto pending the coming into force of the amendment extending the agreement for cooperation.

The Ambassador avails himself of this opportunity to renew to the Secretary of State the assurances of his highest consideration.

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[1] See p. 2.

DEPARTMENT OF STATE,
Washington, September 20, 1965.

The Secretary of State presents his compliments to His Excellency the Ambassador of the Republic of Indonesia and has the honor to acknowledge the Ambassador's note of September 20, 1965, referring to the Agreement for Cooperation Between the Government of the United States of America and the Government of the Republic of Indonesia Concerning Civil Uses of Atomic Energy signed at Washington on June 8, 1960.

The Government of the United States of America notes with appreciation the statement of the Indonesian Government that it recognizes the continuing effect of the safeguards and guarantees provisions of the agreement for cooperation of June 8, 1960, and that it will hold any materials, equipment, and devices it has received thereunder subject to the terms and conditions of that agreement and those of applicable subsidiary arrangements thereto pending the completion of an amendment extending for a period of 5 years the aforementioned agreement for cooperation.

APPENDIX 3

AEC LETTER SUBMITTING ADDITIONAL INFORMATION ON MISCELLANEOUS SUBJECTS COVERED DURING HEARING ON JANUARY 27, 1966

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., February 7, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: At the hearing of the Subcommittee on Agreements for Cooperation on January 27, 1966, when the agreements for cooperation with Spain, Switzerland, and Indonesia were considered, additional information was requested on several points. I am pleased to provide the information set forth below in response to those requests.

Concerning the exchange of notes with Indonesia regarding the continuing effect of the safeguard and peaceful uses guarantees provisions of the agreement. Mr. Kratzer agreed to confirm that the exchange of notes referred to the equipment, as well as the materials, which had been transferred to Indonesia. Accordingly, I am pleased to confirm that under the exchange of notes the Indonesian Government stated that it would hold any materials, equipment, and devices which it had received under the agreement subject to the terms and conditions of the agreement pending the coming into force of the amendment to extend the agreement.

With respect to plans which Indonesia may have for the construction of a large power reactor, about which you inquired, our information stemmed from a 1963 visit of the then deputy chief of Indonesia's Triga reactor project, who mentioned that consideration was being given to a 180-megawatt electric power reactor in the post-1970 period in the vicinity of Djakarta. While this statement was consistent with other less specific reports at that time, we have had no further reports on the subject.

With reference to Senator Bennett's question as to whether there is any public reaction in Switzerland against atomic electric power plants, we have reviewed our records and find no indication of such reaction.

Senator Gore asked that we inquire into whether the United Kingdom has supplied nuclear fuel to Switzerland and whether such supplies would be subject to safeguards. On October 20, 1965, the United Kingdom Atomic Energy Authority announced that it had received a contract from the Swiss Federal Institute for Reactor Research for the supply of foil-wrapped uranium dioxide pellets for fueling the Swiss NRE test reactor under construction at Würenlingen. The pellets will contain approximately 400 kilograms of uranium at 5 percent enrichment. The value of the contract was estimated at 75,000 British pounds with delivery expected by the end of 1966. This is the only transfer by the United Kingdom to Switzerland of which we are aware.

The agreement between the United Kingdom and Swiss Governments for cooperation in the peaceful uses of atomic energy contains an undertaking that material or equipment obtained pursuant to the agreement, and special fissionable material derived from the use of material or equipment so obtained, will be

employed solely for the promotion and development of the peaceful uses of atomic energy and not for any military purpose. The agreement also provides for safeguard and inspection rights and for consultations with a view to negotiating an agreement under which the controls and safeguards provided by the agreement would be administered by the IAEA.

Please let me know if any further information on these questions should be desired.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

APPENDIX 4

AEC–JCAE CORRESPONDENCE CONCERNING SPANISH DON REACTOR PROJECT

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., December 17, 1965.

Mr. R. E. HOLLINGSWORTH,
General Manager, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. HOLLINGSWORTH: By letter dated December 1, 1965, the Commission submitted to the Joint Committee an executed amendment to the Spanish bilateral concerning civil uses of atomic energy, and supporting correspondence. On page 2 of this letter there is a reference to a cooperative arrangement which is currently being negotiated with Spain, as a part of which the initial enriched uranium and heavy water requirements for the Spanish heavy water, organic-cooled reactor prototype (DON) would be loaned to Spain over a period of 5 years.

I would appreciate receiving further information on the status of these negotiations and the Commission's objectives in entering into such an arrangement.

Thank you for your cooperation.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., January 14, 1966.

Mr. R. E. HOLLINGSWORTH,
General Manager, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. HOLLINGSWORTH: This is in reference to my letter to you of December 17, 1965, concerning a proposed cooperative arrangement with Spain involving a heavy water, organic-cooled reactor prototype (DON). In that letter I requested further information on the status of AEC-Spanish negotiations concerning the DON project and the Commission's objectives in entering into such an arrangement.

Although my letter was acknowledged on December 21, the Joint Committee has not received a response to my inquiry.

The January 6, 1966, issue of Nucleonics Week contains the following statement:

"DON project. There is an AEC-Junta memorandum of understanding on the 30-megawatt-electric DON project, which will be the basis of a formal cooperative agreement providing the Spanish government approves the project (Nucleonics Week, Sept. 23, 1965, No. 5.) In return for AEC access to DON technical data, the agreement would provide for AEC technical assistance and an AEC waiver of use charges on the reactor's U^{235} and D_2O requirements. AEC is expected to request a fiscal year 1967 authorization for the waiver of charges."

If this article is accurate it would appear that the AEC has already entered into a memorandum of understanding covering this project which may involve congressional action in fiscal year 1967.

I again request the information I asked for in my December 17 letter so that the committee may be kept fully and currently informed concerning this matter.

Thank you for your cooperation.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., January 18, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This is in response to your letter of December 17, 1965, which inquired as to the status of the proposed arrangement for cooperation with the Spanish Junta de Energia Nuclear in its organic-cooled, heavy water moderated reactor (DON) and the objectives of such an arrangement.

In the course of meetings held with Professor Otero, President of the Junta, on May 21–22, 1964 (reported in our letter to the Joint Committee of June 4, 1964), a principal item that was discussed involved Spain's desire to enter into a collaborative effort with the AEC in the development and construction of a 30-megawatt electric, organic-cooled, heavy water moderated power demonstration reactor called the DON project. Both the Junta and Atomics International (the U.S. contractor for the Junta DON project) submitted proposals to the Commission requesting that we made a fairly sizable financial contribution to various aspects of the project. While it was felt that a financial contribution of the magnitude suggested by the Junta and Atomics International was too large in view of the Commission's own plans for the development of a heavy water moderated reactor, it was decided that, because the DON program has well defined short-term objectives, U.S. access to the operating experience with the DON and its experimental facility would produce useful results in fabrication and design problems that could be extrapolated to the overall U.S. heavy water reactor program.

In view of this, the Commission subsequently informed the junta that while we were not prepared to make a direct dollar contribution to the DON project, we were prepared to develop for consideration a cooperative exchange arrangement under which the Commission would loan over a 5-year period, the initial heavy water (estimated to be approximately 40,000 kilograms) and enriched uranium (approximately 220 kilograms) required for the DON reactor. During this period, the Commission would waive use charges of these initial inventories. The Government of Spain would reimburse the AEC for any burnup and losses of enriched uranium as well as any losses of heavy water. At the end of the 5-year period, Spain would have the option of purchasing the heavy water and enriched uranium or returning the material originally loaned. The Commission would also provide comprehensive information relating to the development, design, fabrication, construction, and operation of the first heavy water, organic cooled power reactor to be built in the United States. In return for these U.S. contributions, the Junta would furnish the Commission comprehensive information relating to the research, design, fabrication, construction, and operation of the DON reactor.

We have forwarded a draft "Memorandum of Understanding" to the junta with the understanding that, following agreement on the text of this draft, the Commission's ability to commit itself to any loan of enriched uranium and heavy water would be contingent upon the receipt of the necessary approvals within the U.S. Government, including specific authorization from the Congress. This position was reiterated at the time of the signing of the amendment to the Agreement for Cooperation.

The current status of this matter is that the Junta is awaiting approval of the DON project by the Spanish Government. While no discussions are now taking place with respect to the draft memorandum, it is our understanding that the junta is in basic agreement with it. They do not, however, wish to give a formal response until the DON project has been approved.

I shall be pleased to answer any further questions you may have in this matter.

Sincerely yours,

(Signed) DWIGHT INK,
Assistant General Manager.

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., January 20, 1966.

Mr. ROBERT E. HOLLINGSWORTH,
General Manager, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. HOLLINGSWORTH: Reference is made to the Commission's January 18 letter concerning cooperation with Spain in the heavy water organic reactor field. If the Commission does decide to propose such a cooperative effort, please supply the committee with specific information concerning the "well defined short-term objectives" in the DON program and the "useful results in fabrication and design problems" that would be of value in the overall U.S. program.

In addition, please identify any presently planned efforts in the U.S. program which could be eliminated or reduced in scope because of data which you would expect to obtain from a DON cooperative exchange arrangement.

Thank you for your cooperation in this matter.

Sincerely yours,

JOHN T. CONWAY,
Executive Director.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., January 26, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This is in response to your letter of January 14, 1966, which requested the information first asked for in your letter of December 17, 1965. Our letter of January 18, 1966, was prepared prior to receipt of your January 14 letter. I regret the delay in responding to your original inquiry.

While I believe our letter of January 18, 1966, provides the information which you originally requested, I would like to add that the proposed cooperation with Spain in the DON project is not a part of our current fiscal year 1967 authorization bill, since the DON project has not received the approval of the Spanish Government. In this respect the article which appeared in the January 6, 1966, issue of "Nucleonics Week" is inaccurate. I should also like to note that the Memorandum of Understanding referred to in my letter of January 18, 1966, was provided to Spain in order to insure that there was agreement on the basic principles of any cooperative arrangement which might ultimately be proposed for authorization in order to avoid a situation such as that which occurred in the case of the planned cooperation with the German AVR project, where we were unable to reach agreement on the principles of the arrangement following congressional authorization.

We still have no indication as to whether or when the DON project may be approved by the Spanish Government. This is a situation which has prevailed for well over a year and which made it impossible for us to include this item in our fiscal year 1966 authorization proposal. If the project is approved by the Spanish Government and agreement reached with Spain on the principles of the cooperation during the present congressional session, consideration would be given by the Commission as to when authorizing legislation should be requested, but, in the absence of information from the Spanish Government, no decision has been made on this question.

Sincerely,

(Signed) DWIGHT INK,
Assistant General Manager.

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., February 16, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This is in response to your letter of January 20, 1966, which requests specific information concerning the DON program.

As you know, the Commission's interest in the DON program is based principally on its relation to our own heavy water organic cooled reactor (HWOCR) program. During our discussions with Professor Otero in 1964, reported in our

letter of June 4, 1964, the AEC's heavy water organic program was under review. Since that time, the review has been completed and the development of a heavy water organic-cooled reactor and related technology has been identified as a specific AEC objective. As you will recall, the objective of the DON program is to develop and construct a 30 megawatt electric heavy water, organic-cooled prototype power reactor and to have the reactor in operation within a relatively few years (present plans of the Junta are to have the reactor operating by 1969). The well defined short-term objectives to which we referred in our letter of January 18, 1966, are the anticipation that the DON reactor would be constructed in advance of the U.S. prototype and the fuel element development and coolant and moderator technology that are associated with the DON program. The construction of the DON in advance of the HWOCR could produce transferable knowledge resulting from its earlier construction and operational experience. If it should appear that the DON will not be brought into construction and operation sufficiently in advance of our HWOCR, we would have to review the desirability of the proposed arrangement.

Although the plant size and performance conditions of the DON differ from those of the AEC's HWOCR program, the similarity of concepts in the two projects does provide a mutual technical interest. Specifically, both reactor systems are planning on the use of SAP clad UC rod bundles, SAP pressure tube assemblies, terphenyl as the organic coolant, and heavy water as the moderator. While the size and performance conditions of the DON reactor will not permit a direct transfer of engineering factors, the similarities of the two projects are sufficient to warrant a technical interest and to forecast a general benefit emanating from the DON program in broadening the base of this technology. This type of benefit, however, is not such as to warrant a substitution of DON technology for portions of our own program or of any identifiable reduction in, or elimination of, our planned program.

As an additional factor in our consideration of this proposal with the Junta, I would like to note that Atomics International has participated in the preparation of the preliminary design of the DON and will be its designer. Experience benefits should, therefore, be realized from this participation by Atomics International.

I shall be pleased to answer any further questions you may have in this matter.

Sincerely yours,

(Signed) R. E. HOLLINGSWORTH,
General Manager.

APPENDIX 5

DIPLOMATIC NOTE DELIVERED BY TURKEY CONCERNING CONTINUING EFFECT OF SAFEGUARD AND GUARANTEE PROVISIONS OF EXPIRED AGREEMENT

TURKISH EMBASSY,
Washington, D.C., June 9, 1966.

No. 275.900/941–159.

The Honorable the SECRETARY OF STATE,
Department of State, Washington, D.C.

EXCELLENCY: This refers to the proposed Amendment to the Agreement For Cooperation Between the Government of the Turkish Republic and the Government of the United States of America Concerning Civil Uses of Atomic Energy signed in Washington on May 11, 1966.

Certain steps required by Turkish law to bring the aforementioned Amendment into force will in all likelihood not have been satisfied by June 9, 1966, the date on which the existing Agreement For Cooperation of June 10, 1955, as amended, between our Governments will expire.

This Embassy, upon instructions from the Ministry of Foreign Affairs gives its assurances that,

The Government of the Turkish Republic continues to recognize the provisions concerning the safeguards and guarantees of the Agreement For Cooperation of June 10, 1955, as amended, and states that it will hold any materials, equipment, and devices it has received thereunder subject to the terms and conditions of that Agreement and those of applicable subsidiary arrangements thereto, pending the coming into force of the Amendment signed in Washington on May 11, 1966.

Accept, Excellency, the renewed assurances of my highest consideration.

TURGUT MENEMENCIOGLU, *Ambassador.*

APPENDIX 6

U.S.-U.S.S.R. STATE COMMITTEE MEMORANDUM ON COOPERATION (1963)

Memorandum on cooperation in the field of utilization of atomic energy for peaceful purposes between the U.S. Atomic Energy Commission and the State Committee of the USSR for the Utilization of Atomic Energy pursuant to the Agreement between the United States of America and the Union of Soviet Socialist Republics on exchanges in the scientific, technical, educational, cultural, and other fields in 1962–1963

The U.S. Atomic Energy Commission and the State Committee of the USSR for the Utilization of Atomic Energy;

Bearing in mind the cooperation implemented to date in the field of peaceful uses of atomic energy;

Desiring further expansion and development of this cooperation;

Recalling Section II (3) of the Agreement between the USA and the USSR on exchanges in the scientific, technical, educational, cultural, and other fields in 1962–1963, signed at Washington on March 8, 1962;

Have agreed upon the following arrangements and procedures for carrying out reciprocal exchanges in the course of 1963–1965;

I. EXCHANGE OF SPECIALIST VISITS

For the purpose of studying scientific and technical achievements in the field of peaceful utilization of atomic energy in the USA and the USSR, both Parties agree to conduct exchanges of visits by groups of specialists to scientific establishments in the USA and the USSR on an agreed and reciprocal basis in the following fields:

1. Nuclear power reactors, including fast neutron reactors and nuclear superheat reactors;
2. Plasma physics and controlled thermonuclear fusion;
3. Nuclear physics, physics of high and low-energy particles;
4. Solid state physics;
5. Purification and disposal of radioactive waste products;
6. The use of tracer compounds in medicine;
7. Radioneurological research;
8. Design and utilization of charged particle accelerators.

As to the production, separation, and purification of transplutonium isotopes, this question is subject to agreement in 1964.

The visits indicated above, as well as additional visits which may be agreed in these and other fields of peaceful uses of atomic energy, shall be carried out in accordance with the following procedures:

a. The specific dates and duration of visits, composition of groups, list of facilities to be visited, as well as the specific field of activity contemplated by each Side for each exchange of visits, shall be agreed upon between the U.S. Atomic Energy Commission and the State Committee of the USSR for the Utilization of Atomic Energy, and confirmed through diplomatic channels. However each group of specialists from either Side will consist of up to ten (10) persons and the length of each visit will be from 10 to 15 days.

b. In all cases the sending country will pay the subsistence, lodging, transportation and other expenses of its scientists and personnel accompanying them to their destination and return, as well as within the host country. The host country will be responsible for making suitable arrangements such as hotel accommodation and travel, and for providing necessary interpreters.

c. This Memorandum should not be construed to cover principles and conditions governing the participation of scientists and specialists of both countries in conferences (symposia) organized in the USA and the USSR.

d. Agreement in regard to any exchanges under this Memorandum may be terminated by either Side on thirty days notice.

II. EXCHANGE OF RESEARCH SPECIALISTS

The Parties agree to implement an exchange of 2–3 research specialists in each of the fields of controlled thermonuclear fusion, reactor techniques, and the physics of high-energy particles to gain practical experience and to study the performance of operating thermonuclear installations and apparatus, reactors and accelerators in the USA and the USSR for a term of not over one year. This term shall be determined by agreement in each separate case.

III. EXCHANGE OF INFORMATION

The Parties agree to exchange scientific information on a reciprocal basis by means of sending unclassified documents (books, monographs, and preprints) on current work concerned with the peaceful uses of atomic energy. The Parties shall each provide the other each month ten (10) new documents (2 copies each) starting from the month following signing of this Memorandum until the end of the term of this Memorandum. Initially, the exchange of documents would be in the areas in which the Parties agree to exchange visits. The number of documents to be exchanged and the list of areas of exchanges may be increased by agreement.

The Parties also agree to exchange doctoral dissertations in the fields of high energy physics, nuclear physics, solid state physics, controlled thermonuclear fusion, and the use of tracer compounds in medicine. Initially, the Parties agree to exchange forty (40) such suitable dissertations (two copies each) on current work, provided that this number may be increased by mutual agreement. In this connection the Parties have agreed that the dissertations sent by the State Committee of the USSR for the Utilization of Atomic Energy shall consist of dissertations for the degree of candidate of science as well as doctor of science.

In order that the International Atomic Energy Agency and its members may fully benefit from this cooperation, the reports and other documents which the Parties to the agreement will exchange will also be transmitted to the Agency.

IV. HOLDING JOINT CONFERENCES AND DISCUSSING RESEARCH ON SPECIFIC SCIENTIFIC PROBLEMS

The Parties agree to hold joint conferences of specialists of both countries to discuss works on low-energy nuclear physics (in the Soviet Union) and on purification of liquid radioactive wastes from power and research reactors and radiochemical laboratories, and solidification and disposal of radioactive wastes (in the United States). The scheduling of conferences and the number of participants shall be agreed upon later.

V. EXCHANGE OF INSTRUMENTS

The Parties will consider the possibility of making available to each other scientific instruments on agreed terms and on a reciprocal basis. Such arrangements will proceed only to the extent mutually agreed upon and permissible under the laws and export policies of the respective countries.

* * * * * * *

The U.S. Atomic Energy Commission and the State Committee of the USSR for the Utilization of Atomic Energy may, from time to time, come to agreement on additional proposals which will be subject to approval by both Sides.

This Memorandum shall enter into force on the date of its signature and shall thereupon replace the Memorandum on cooperation between the USA and the USSR in the field of the utilization of atomic energy for peaceful purposes, signed at Washington on November 24, 1959.

This Memorandum shall continue in force for the years 1963–1965, provided that its continuation beyond 1963 shall be subject to the anticipated renewal of the existing inter-governmental agreement on exchanges.

Done at Moscow on May 21, 1963, in duplicate in the English and Russian languages, both texts being authentic and having equal force.

For the U.S. Atomic Energy Commission:

GLENN T. SEABORG.

For the State Committee of the USSR for the Utilization of Atomic Energy:

ANDRONIK PETROSYANTS.

APPENDIX 7

CORRESPONDENCE CONCERNING SUBMISSION TO JCAE OF AGREEMENTS TRANSFERRING SAFEGUARDS RESPONSIBILITIES TO IAEA

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., March 28, 1966.

Mr. ROBERT E. HOLLINGSWORTH,
General Manager, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR MR. HOLLINGSWORTH: This will confirm and supplement a recent telephone conversation between Mr. England of the Joint Committee staff and Mr. Myron Kratzer, Director of the AEC's Division of International Affairs.

As you know, the trilateral agreements entered into by this country with the International Atomic Energy Agency and third countries for the transfer to the IAEA of responsibility for applying safeguards under our civil agreements for cooperation are made pursuant to and in implementation of bilateral agreements which under the Atomic Energy Act must be submitted to the Joint Committee before becoming effective. Nevertheless, to date the Atomic Energy Commission has not regularly notified the JCAE when these trilateral arrangements have been entered into, nor has the Commission furnished the Committee with copies of the agreements.

In light of this, and in view of the critical importance which our Government understandably attaches to the administration of safeguards under its agreements for cooperation in the peaceful uses of atomic energy, I think it desirable that we now establish a systematic procedure for the submission of these trilateral agreements to the Joint Committee.

The Joint Committee, therefore, would be appreciative if henceforth the Atomic Energy Commission would notify the Committee when any trilateral agreement transferring to the IAEA responsibility for applying safeguards under a U.S. agreement for cooperation has been signed. It would also be appreciated if the AEC in doing so would furnish the Committee with three copies of the trilateral agreement and a brief explanation of the agreement's major provisions.

For present purposes the Committee is desirous of obtaining a listing of all countries with which we have completed arrangements to transfer safeguards to the IAEA and the date on which such transfer became effective.

Your cooperation is appreciated.

Sincerely yours,

JOHN T. CONWAY, *Executive Director.*

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., April 15, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: In response to your recent request to Mr. Kratzer and your letter of March 28, I am pleased to furnish information regarding trilateral agreements between the U.S., IAEA and third countries for the transfer of safeguards responsibilities under our bilateral agreements with those third countries.

The enclosed list shows all trilateral agreements which have come into force. The action which brings these trilateral agreements into force is acceptance by the IAEA of the joint inventory declaration agreed to by the U.S. and the other government. Prior to its acceptance of this inventory the Agency arranges, with the other government, as contemplated in the Agency safeguards system, detailed procedures covering such matters as records to be maintained and reports to be furnished to the Agency. It then notifies the U.S. of its acceptance of the joint inventory and the agreement is thus brought into force. Trilateral agreements with Argentina, Iran, Israel and Norway have been signed and are awaiting the completion of these procedures.

In the future this procedure will be changed so that the agreement enters into force upon signature by all parties. The conditions for effecting actual transfer of safeguards administration to the IAEA is stated in terms of the acceptance by

the Agency of the inventory of U.S. supplied material and equipment. The Agency plans to retain, however, the procedure of accepting the inventory only after arrangements concerning records and reports have been completed.

For your information, I am enclosing three copies of all the trilateral agreements which have been signed and brought into force.

In the future, we will inform you when each trilateral is signed, and will provide you at that time with a copy and a résumé of its principal provisions. We will then inform you when the transfer of administration of safeguards to the IAEA is effected.

If any further information on this subject should be required, please let me know.

Sincerely yours,

JOHN A. HALL, *General Manager.*

(Enclosures: (1) List of Trilateral Agreements. (2) Copies of Trilateral Agreements [omitted; on file with the Joint Committee].)

List of trilateral arrangements for transferring safeguards to the IAEA which have been signed and have entered into force

Country concerned	*Effective date of agreement*
Austria	Dec. 13, 1965
China	Oct. 29, 1965
Greece	Jan. 13, 1966
Philippines	Sept. 24, 1965
Portugal	Dec. 15, 1965
South Africa	Oct. 8, 1965
Thailand	Sept. 10, 1965
Vietnam	Oct. 21, 1965
Japan	Nov. 1, 1963

APPENDIX 8

CORRESPONDENCE CONCERNING COCOM DECISION RELATIVE TO EXPORT OF NUCLEAR REACTORS TO COMMUNIST COUNTRIES

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
February 17, 1966.

Hon. ANTHONY M. SOLOMON,
Administrator, Mutual Defense Control Act,
Department of State, Washington, D.C.

DEAR MR. SOLOMON: As you may know, the recent decision of the international security trade coordinating committee (COCOM) relating to the export of nuclear power reactors to countries of the Sino-Soviet bloc was the subject of discussions at a public hearing held on January 27, 1966 by the Joint Atomic Energy Committee's Subcommittee on Agreements for Cooperation. The COCOM decision to which I refer provides that COCOM members will "sympathetically" consider requests by member-countries for the export to Communist countries of civil research and power reactors, major components thereof, and fuel and moderators therefor, when the purchasing country has agreed to allow International Atomic Energy Agency safeguards to be applied to the exported facility.

My reason for writing to you relates to your implementation of this decision. According to the State Department's recent report to the Congress on operations under the Battle Act, the Mutual Defense Assistance Control Act Lists—the so-called Battle Act Lists—have been revised to correspond with revisions made in the lists of items embargoed by the COCOM countries. Specifically, I note that the Battle Act Lists have been amended so that the above-named atomic energy materials and equipment now appear in Category B of the Title I List when the recipient Communist nation has agreed to allow the application of IAEA safeguards; when no agreement has been reached as to the application of international safeguards, the subject materials and equipment are considered Category A items.

As I understand the administration of the Battle Act Lists, the items determined to warrant embargo under Title I of the Battle Act are divided into Categories A and B, with the items shown in the Category A List being those for which no exceptions are possible under the termination-of-aid clause of the Battle Act. The items shown in the Category B List are those for which the President may grant exceptions under the termination-of-aid clause in unusual circumstances. Thus, under the Battle Act Administrator's recent revision of these lists, any allied nation which hereafter exports a nuclear power reactor to a Sino-Soviet bloc country which agrees to the application of international safeguards thereto may continue to receive military, economic or financial assistance from the United States if the President so directs. Prior to this revision of the Lists the President could not make such an exception.

This change in the Battle Act Lists raises several questions. One is whether or not this revision contravenes the general policy underlying the Battle Act, namely, the policy of not giving assistance to any foreign nation which permits the export of arms, ammunition, or other material to the Soviet Union or any of its satellites when such material might contribute to the strength of those states. (See in this connection Senate Report 698, August 21, 1951.) It would seem that a power reactor would contribute to the industrial strength of a country, even if the application of IAEA safeguards prevented the diversion of the reactor to military uses.

A more serious question is whether, as contemplated under your recent amendment to Category B, the President may invoke the exception to the Battle Act's termination-of-aid clause in the case of the export by an allied nation of a reactor to a Communist-bloc country. The proviso to the termination-of-aid clause in Section 103(b) of the Battle Act provides that "the President . . . may direct the continuance of such [military, economic, or financial] assistance to a country which permits shipments of items *other than* arms, ammunition, implements of war, and atomic energy materials when unusual circumstances indicate that the cessation of aid would clearly be detrimental to the security of the United States." [Emphasis supplied.] The distinct implication of this proviso seems to be that while aid can be continued despite the export to Sino-Soviet bloc countries of strategic materials "other than" arms, ammunition, implements of war, or atomic energy materials, such continued aid cannot be allowed where the exported item falls into the category of arms, ammunition, implements of war, or atomic energy materials.

I would very much appreciate receiving your early comments to the foregoing questions.

Sincerely yours,

(S) CRAIG HOSMER,
Member of Congress.

DEPARTMENT OF STATE,
Washington, D.C., March 4, 1966.

Hon. CRAIG HOSMER,
House of Representatives.

DEAR CONGRESSMAN HOSMER: Your letter of February 17 refers to the recent decision of COCOM relating to the export of nuclear power reactors to Soviet bloc countries and raises certain relevant questions pertaining to Battle Act administration.

You are quite correct in your understanding that the effect of the transfer from Category A to Category B of Title I is to make it possible for the President to exercise discretion under Section 103(b) in determining whether or not to continue aid in the case of a power reactor sale by an aid-recipient country to a Communist bloc country, whereas termination of aid is mandatory with respect to Category A. Your questions relate to whether the determination to transfer the items in question from Category A to Category B of Title I contravenes the general policy underlying the Battle Act and whether the President may properly invoke the exception to the Battle Act's termination-of-aid clause in Section 103(b) in the case of a power reactor sale by an aid-recipient nation to a Communist bloc country. It is our view that the Title I listing determination taken, including its implications for the President's authority under Section 103(b) to continue aid, is in accordance with the provisions of the Battle Act. Moreover, similar decisions have been made in the past and have been reported to the Congress. I believe the following explanation will be helpful to you in understanding the reasons for our conclusion.

In the administration of the Battle Act, and in working out the international control lists under the Act, the key judgment which Congress entrusted to the Battle Act Administrator was whether particular items should be embargoed for purposes of the Act.

Section 103(a) of the Battle Act (22 U.S.C. 1611b) provides, in pertinent part, as follows [emphasis supplied]:

"The Administrator is hereby authorized and directed to determine within thirty days after enactment of this Act . . . and notwithstanding the provisions of any other law, *which items are, for the purpose of this Act,* arms ammunition, and implements of war, *atomic enregy materials,* petroleum . . . and those items of primary strategic significance used in the production of arms, ammunition, and implements of war *which should be embargoed to effectuate the purposes of this Act: Provided,* That *such determinations shall be continuously adjusted to current conditions* on the basis of investigation and consultation . . . ."

Section 103(a) of the Battle Act uses two phrases which make clear that the categories of items listed in that section are inherently qualified. They must be (1) items which "for the purpose of this [Battle] Act" are arms, ammunition, and implements of war and the like, and (2) items "which should be embargoed to effectuate the purposes of this [Battle] Act".

The purposes of the Battle Act are perhaps most succinctly expressed in its long statutory title, i.e., "An Act to provide for the control by the United States and cooperating foreign nations of exports to any nation or combination of nations threatening the security of the United States, including the Union of Soviet Socialist Republics and all countries under its domination, and for other purposes." The key words are "control" and "cooperating foreign nations". These statutory words show that the Congress had in mind not absolute, unilaterial embargoes but an international cooperative program of control.

In this cooperative control program, as the Congress was aware, the United States necessarily would have a variety of objectives and means to pursue these objectives.

H.R. 4550 (82d Cong., 1st Sess. 1951) was the bill which, with some amendments not relevant here, became the Battle Act. In the House Foreign Affairs Committee report on H.R. 4550, the complex nature of our objectives in controlling exports to Russia was discussed, and the report made the following comment:

"In order to carry on strategic operations of this nature it is essential that the executive branch be given a considerable degree of discretion and it is clear that legislation prohibiting broad categories of exports might prevent the attainment of these objectives." (H. Rep. 703, 82d Cong., 1st Sess. July 16, 1951, p. 12)

We have reviewed Senate Report No. 698 on the same bill, which was referred to in your letter, and find nothing inconsistent with either this statutory statement of purpose or this recognition of executive discretion. Section 101 of the Battle Act, which elaborates the statement of purpose, states that the objective of controls, so far as the USSR and its satellites is concerned, is to impede the ability of such countries "to conduct military operations".

We have therefore concluded that the Act was not intended to require the embargo of items which would not contribute to the military capability of Sino-Soviet bloc countries, even though they might contribute to the industrial strength of a country. This conclusion is consistent with the views of previous Administrators of the Act and is supported by practice. The periodic Battle Act reports to the Congress provide evidence of the selective listing of items under the Act, of periodic changes in accordance with Section 103(a), and of the movement of items from Category A to Category B of Title I.

The Battle Act's embargo provisions went into effect on January 24, 1952, and the published reports thereafter included information on the embargo lists, how they were established, and how they are maintained. There are two lists under Title I of the Battle Act. The Title I, Category B list originally included 263 item listings, of which one was petroleum products and equipment for producing them. By the time of the second Battle Act report, sixteen new item listings had been added and fifteen original listings broadened. The specific item listings in Category B were classified for security reasons, but the report could identify the added listings in general terms. ("Problems of Economic Defense", 2d Report to Congress on the Battle Act, January 1953, pp. 7 and 8).

By the time of the fourth Battle Act report, the decision had been made not to pursue an extension of the control lists to many other items but to recognize the need for simplifying the lists and removing or downgrading items which were no longer considered so important. ("East-West Trade Trends", 4th Report to

Congress, May 1954, pp. 46 to 48). The results of this reappraisal were announced in a press release on August 25, 1954; there was a reduction in the embargo item listings from 297 to 217, and many of the 217 items were redefined so as to split off less important sizes and types of goods covered by the item. ("The Revision of Strategic Trade Controls", 5th Report to Congress, November 1954, pp. 39–42.)

The same process, of course, was carried out for Category A items. Thus, in the 1958 Battle Act Report, revisions in the Category A list were announced in the following terms:

"Some new items . . . embodying recent technological and scientific advances, and whose strategic significance had increased since the 1954 revision, were added. Other items were deleted because of a corresponding decrease in their strategic importance." ("The 1958 Revision of East-West Trade Controls", 12th Report to Congress, April 20, 1959, pp. 4–5)

In the unclassified Category A list printed in this report, it was noted, for example, that some changes resulted in the deletion of items from the atomic energy material listing under Category A and the incorporation of those items in the classified Category B list (page 12). These changes were of the same type as those about which you have inquired.

This legislative history and reported practice make clear that there is no statutory distinction between Category A and Category B of Title I in terms of the determination of whether an item should be embargoed for the purposes of the Act. In determining whether or not an item shall be considered an "atomic energy material" for the purpose of the Act, the Administrator considered that the application of IAEA safeguards would give reasonable assurance that the materials would be devoted to peaceful uses only and that the shipment would therefore lack the stragetic element to which the Battle Act restrictions were addressed. It follows, therefore, that the Administrator acted in accordance with the listing authority of the Act in removing those materials from Category A to Category B, because they still remain covered under Title I. Whether or not the President decides to continue aid to a country selling such a Category B item to a Communist bloc nation will depend upon the circumstances of the particular case.

For the reasons I have set forth in detail above, I consider that the modification in Title I treatment of civil research and power reactors, major components thereof, and fuel and moderators therefor is in accordance with the purposes of the Battle Act and appropriately furthers the United States policy of discouraging nuclear weapons proliferation and encouraging peaceful uses of atomic energy.

May I add that if you have any remaining questions on this matter, please let me know. We and the Atomic Energy Commission people would be glad to meet with you or other members and staff of the Joint Committee in order to be certain that there is full understanding of our actions under the Battle Act and in COCOM concerning nuclear power reactors subject to IAEA safeguards. We have done this previously, as you know, both through informal discussion and in letters to the Chairman, and we would like to be sure that no area of misunderstanding remains.

Sincerely yours,

(S) ANTHONY M. SOLOMON,
Assistant Secretary for Economic Affairs.

APPENDIX 9

JCAE–AEC CORRESPONDENCE CONCERNING DISSEMINATION OF NUCLEAR FUELS REPROCESSING TECHNOLOGY

CONGRESS OF THE UNITED STATES
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D.C., August 19, 1965.

Hon. GLENN T. SEABORG,
Chairman, U.S. Atomic Energy Commission,
Washington, D.C.

DEAR DR. SEABORG: This month, along with Congressman Craig Hosmer and Joint Committee Staff Director John Conway, I participated in a two-day meeting at Rowe, Massachusetts, sponsored by the Atomic Industrial Forum, to review and discuss the problem of nuclear proliferation and possible safeguards. Altogether, approximately 35 individuals attended the meeting, including repre-

sentatives of the AEC, Defense Department, State Department, and the White House.

Included in the meeting was a visit to the Yankee atomic plant where we were able to review the methods used by the International Atomic Energy Agency to inspect the plant and to observe use of IAEA seals placed on reactors to assure fuel elements are not being removed between inspections.

Although there was agreement that inspection of a reactor is important in any safeguards procedure to assure against diversion of nuclear material to military use, there was recognition that an essential item in any safeguards procedure is a requirement that fuel reprocessing plants be subject to complete inspection.

During the discussion, a representative of Nuclear Fuel Services, Inc. (NFS) mentioned that representatives of two foreign nations, which do not have nuclear weapon capability, were visiting the NFS reprocessing plant. He advised that in accordance with the AEC policy, NFS was cooperating with these foreign nationals to the extent of furnishing information on how to build and operate reprocessing facilities.

In view of the vital importance a nuclear fuel reprocessing facility would have to any nation intending to obtain independent nuclear weapon capability, I question whether the AEC should, as a matter of policy, be encouraging other nations to develop this capability. At a minimum, it would seem to me a "non-nuclear" nation should not be assisted in obtaining information and technical know-how on reprocessing technology unless that nation first agrees that any reprocessing facility it builds will be placed under IAEA safeguard inspection.

I would appreciate receiving the Commission's views on this matter.

Sincerely yours,

CHET HOLIFIELD, *Chairman.*

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., September 15, 1965.

Hon. CHET HOLIFIELD,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. HOLIFIELD: Thank you for your letter of August 19, concerning the application of safeguards to reprocessing facilities located abroad.

I am in full agreement with the importance of bringing reprocessing facilities abroad under safeguards. We are currently undertaking a study to determine how this can best be accomplished with particular attention to the approach that information and technical know-how should be supplied only on the condition that safeguards be applied to the facility involved. In considering this approach we are taking into account the fact that information in this area is unclassified and AEC regulations have for a number of years permitted the furnishing of unclassified information by U.S. industry to non-Soviet bloc countries. In addition, despite the fact the reprocessing facilities generally involve conventional materials and components, we are hopeful that it will be possible to identify some specialized items which, when supplied by one country to another for use in a reprocessing facility, should be accompanied by a requirement that safeguards will be applied to the facility. As in the case of controls over reactors, it is important to secure agreement from other potential suppliers to require controls over the same items as are controlled by the U.S. and we will, of course, seek to secure such agreement.

Pending completion of our study, I am confident that we will receive the voluntary cooperation of U.S. industry in connection with any problems which might arise.

Your letter refers to statements by representatives of Nuclear Fuel Services concerning the interests of two foreign countries which had expressed an interest in obtaining technical help from Nuclear Fuel Services. The countries in question were Japan and Italy. We understand that no assistance was provided to either of these countries by Nuclear Fuel Services but only that the inquiries were made by these countries to which NFS indicated that it would be prepared to cooperate to the extent permitted by United States government policy. In the case of Italy no detailed exploration of possible assistance took place and NFS has had no further inquiries from it. We are aware, however, that Italy is undertaking through its own resources the construction of a small reprocessing plant in northern Italy for research reactor fuel elements.

An inquiry was also made to the Bechtel Company approximately a year ago by Pakistan, to which Bechtel replied that it was willing to consider providing

services in this area. No further word has been received from Pakistan by Bechtel and we are unaware of any plans on the part of Pakistan to build a reprocessing plant.

In the case of Japan, plans have been in progress for several years to build a reprocessing facility. This facility is to be built by the Japan Atomic Fuel Corporation (JAFCO), a mixed private-governmental organization which has responsibility for nuclear fuel development and production in Japan. Their intention is to construct a plant with a capacity of approximately 0.7 tons of uranium per day for completion in 1970. A preliminary design for this plant was prepared by a British firm, Nuclear Chemical Plant, Ltd. Last fall, JAFCO sought bids for the detailed design of the plants. Bids were received from the Nuclear Chemical Plant, Ltd., and a French concern, Saint Gobain, which was responsible for the design and construction of the French reprocessing facilities. No United States firms bid at this time. Japan Atomic Fuel Company has rejected both bids recently due to high costs and is now seeking new bids. It was this recent inquiry to which the NFS representative at the Yankee meeting referred. We understand that JAFCO has decided not to solicit bids from the Bechtel-NFS group and intends to confine its interest in the rebidding to the British and French firms who bid earlier.

Two United States firms, American Machine and Foundry and Vitro, are associated with the British bidder as sub-contractors with respect to the mechanical head-end components of the facility. A U.S. consulting firm, J. C. Dart and Associates is serving as consulting engineer to JAFCO in connection with the solicitation and evaluation of bids. We will carefully review the scope of activities of these firms to determine whether they should be restricted in any way and whether they constitute an adequate basis for requiring the application of safeguards to the plant involved as a condition of their rendering services.

I should also like to inform you that we are taking steps to urge Japan to place its entire atomic energy program, including its proposed processing plant, under IAEA safeguards on a voluntary basis. As an alternative, if Japan is unwilling to submit its entire program to safeguards, we have proposed that they submit their proposed reprocessing plant. As you know, the existing IAEA safeguards system requires that fissionable material that becomes subject to the system, or an equivalent amount substituted therefor, must remain under the system throughout any subsequent reprocessing or use. Thus, all U.S. material supplied to Japan and any plutonium produced from its use will be subject to the IAEA system during its processing in a Japanese separations plant, except to the extent that Japan can substitute unsafeguarded material, a capability which it does not have at present. This is also applicable to material supplied by, or produced from, the British reactor in Japan which has recently been placed under IAEA safeguards. Nevertheless, since it appears that Japan is in a position to construct a reprocessing plant under any circumstances and also has the capability of building reactors without U.S. or other outside assistance giving rise to safeguards, it would be highly desirable if Japan could be pursuaded to place its separations plant as such under IAEA safeguards.

On a related matter, I believe you would also be interested in knowing that, under our existing Agreement with the Agency providing for safeguarding of the Yankee reactor, arrangements are under way with the IAEA to apply its safeguards to Yankee reactor fuel elements while undergoing processing at the NFS plant at West Valley, New York. We believe that the experience gained by the Agency in applying safeguards at the NFS reprocessing plant will significantly advance our ability to persuade Japan and other countries to place their reprocessing plants under Agency safeguards.

We shall keep you informed of the outcome of our studies on the application of safeguards to reprocessing plants and the activities of the companies referred to above.

Cordially,

GLENN T. SEABORG, *Chairman.*

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., June 20, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: This has further reference to safeguards on chemical processing facilities in foreign countries which was the subject of the letter dated September 15, 1965, from Dr. Seaborg to Congressman Holifield.

In our study of possible steps to bring chemical processing plants in foreign countries under safeguards, we have found it useful to look at those receiving some form of assistance from the U.S. as a different category from those built without U.S. assistance.

As indicated in Dr. Seaborg's letter our study of means of bringing reprocessing facilities abroad under safeguards gave particular attention to the approach that information and technical know-how should be supplied only on the condition that safeguards be applied to the facility involved. We have taken into account the fact that information in this area is unclassified and AEC regulations have for over four years permitted the furnishing of unclassified information by U.S. industry to non-Soviet bloc countries. We have found that there is an area of information and know-how which is in a sense specifically created to be of assistance to a particular chemical processing plant. This area is the provision of services in the form of plans, processing design and architect engineering services related to a chemical processing plant being built in another country. These services, which are both identifiable with a specific plant and recognizable by the other country as well as ourselves as significant assistance to the specific plant, can be used as a means for bringing chemical processing plants in foreign countries under safeguards. The Commission plans to work with other agencies in establishing federal regulatory controls over the provision of chemical processing plant design and engineering services by U.S. firms to other countries. Another area of information and know-how which we have identified and which can be brought under control is the provision of training in U.S. chemical processing facilities and the related matter of long-term guest assignment or employment, of foreigners at U.S. chemical processing facilities.

The Commission is establishing controls over such training and assignments in connection with chemical processing plants to be built abroad and generally such assignments will not be made except in connection with specific plans to build chemical processing plants which will be subject to safeguards.

The safeguards control of chemical processing plant components is complicated by the fact that these plants for the most part use conventional components. We have, however, in our review of these components identified several that can be used as a basis for obtaining safeguards on the plant in which they will be used. These include:

Solvent extraction contractors.—Counter current solvent extractors, such as pulsed columns and mixer-settlers made of corrosion resistant materials and specially designed and intended for use in separating radioactive substances.

Process vessels.—Tanks made of corrosion resistant materials with provision for high integrity such as 100% radiography of welds, incorporating modifications such as lifting trunions with precise dimensioning or remote nozzle connections to permit remote operation and maintenance and specially designed for or intended for use in a facility for separating radioactive substances.

Fuel chopping machines.—Mechanical, pneumatic or hydraulic shears remotely adjustable with a 200 to 300 ton rating designed or intended for use in chopping irradiated nuclear fuel clad with metals such as stainless steel, zirconium or aluminum prior to chemical reprocessing of the nuclear material.

With regard to those chemical processing plants located abroad and constructed without U.S. assistance, we intend to continue our efforts to bring these plants under safeguards. This includes the urging of other supplier nations to attach safeguards to their assistance to chemical processing plants and also to continue to persuade individual countries to place their chemical processing plants under Agency safeguards. It should be noted that regardless of how a reprocessing plant is obtained if it is processing nuclear material subject to U.S., Euratom or Agency safeguards, the plant will be under the safeguards that apply or under safeguards acceptable to these authorities.

In summary as a result of our study the Commission is adopting the following program:

a. Review of exports from the United States under the licensing jurisdiction of the Departments of State and Commerce to assure that important specialized items of equipment specifically designed or intended for use in chemical processing plants will be exported only pursuant to agreements including safeguards provisions.

b. Modify existing regulatory controls within the Executive Branch to restrict the design and engineering services provided in connection with chemical processing plants to be built abroad.

c. Restricting approval for intensive training or long-term assignments to AEC facilities in connection with chemical processing plants to be built abroad, and in which detailed design, construction or operation information would be transmitted, unless agreement on the application of safeguards to the plants is obtained. Generally such assignments would not be made except in connection with specific plans to build a chemical processing plant. However, short-term visits for orientation purposes required by a country contemplating plant construction would be permitted.

d. Continuation of efforts in conjunction with the Department of State to persuade other supplier countries to require safeguards in connection with assistance to chemical processing plants.

e. The Commission intends to continue its efforts in assisting the IAEA in developing effective safeguards for chemical processing plants.

In connection with (d) above which deals with those chemical processing plants constructed by a country without assistance from the U. S., we have again raised the question with the Japanese of placing their proposed chemical processing plant under safeguards administered by the International Atomic Energy Agency. Their response to this approach indicates that positive plans are being made that can lead to submitting the plant to IAEA safeguards. The Japanese advised us that the contract with Saint-Gobain Techniques Nouvelles (SGN) provides for furnishing design information and for granting access to the plant for safeguards purposes and that they were aware of the fact that the fuel of U.S., U.K. and Canadian origin processed at the plant would be safeguarded by the Agency by virtue of the trilateral agreements. SGN is the French company that will design the plant, supervise construction, provide complete operating and maintenance instructions and train personnel.

The Japanese further stated that after commercial and technical aspects of the plant are resolved and when the Agency's procedures for safeguarding chemical processing plants are known, the Government of Japan may consider an offer to place the plant under IAEA safeguards whether it is processing fuel previously subject to safeguards or not.

Also in connection with the planned Japanese chemical processing plant mentioned in the referenced letter, we have had discussions with personnel of U.S. firms involved. Mr. W. A. Nixon formerly associated with Weinrich-Dart Associates (the firm employed by the Japanese to evaluate bids submitted for the design of the chemical processing plant) informed us that he is now employed as an adviser by the Japan Atomic Fuel Corporation (JAFCO) to evaluate and monitor the work being done by SGN. According to Mr. Nixon he will not originate design or supply engineering information in his role as adviser. He has not worked on the design, construction or operation of any Commission chemical processing plant although he was associated with the industrial chemical processing group which studied the possibility of private industry getting into the chemical processing field.

We have also advised AMF International of our interest in obtaining safeguards control over any chemical processing plant built abroad with U.S. assistance. AMF International has been involved in negotiations with SGN to supply the design of the head end of the JAFCO plant. However, AMF International is of the opinion that SGN would design the head end of the plant themselves.

With regard to (e) you were informed in our letter of May 25 of the results of the recent meeting held by the IAEA's Working Group on Reprocessing Plant Safeguards. Also as you know the Agency was offered access to the Nuclear Fuel Services chemical processing plant to assist the Agency in the development of safeguards procedures for chemical processing plants and to assist the Agency in the training of its safeguards personnel. This offer is in addition to the application of Agency safeguards to NFS while Yankee fuel is being processed.

We will continue to keep you informed of significant developments on this matter.

Sincerely yours,

(S) JOHN A. HALL,
Assistant General Manager for International Activities.

APPENDIX 10

REMARKS BY CONGRESSMAN CHET HOLIFIELD ON FLOOR OF U.S. HOUSE OF REPRESENTATIVES CONCERNING 20TH ANNIVERSARY OF THE JOINT COMMITTEE ON ATOMIC ENERGY (AUGUST 2, 1966) [1]

Mr. Speaker, my colleagues on the Joint Committee on Atomic Energy and I were privileged to gather at the White House yesterday to attend the swearing in ceremony of two new Commissioners to the AEC—Dr. Samuel M. Nabrit and Mr. Wilfrid E. Johnson—and to hear President Johnson commemorate the 20th anniversary of the signing into law of one of the most important and unique statutory measures ever enacted by the Congress. I refer to the Atomic Energy Act, the Nation's—in fact the world's—first atomic energy legislation, which was signed into law by President Truman on August 1, 1946.

The Atomic Energy Act was at the time of its enactment, and in many respects remains today without parallel in the legislative history of this country. It is safe to say, I think, that the Atomic Energy Act of 1946 was a radical piece of legislation—in not a few ways alien to all that most of us believe in. Secrecy was the byword. The role of private enterprise in the program was almost nonexistent. Neither nuclear reactors nor the fuels that went into them could be privately owned. In a word, the program, with few exceptions, was one huge Government monopoly.

Nevertheless, the McMahon Act—as the 1946 Act came to be popularly known—served this country well through a trying period. It embodied the wisdom and the best foresight of the Congress and the American people in the period immediately following the close of World War II when atomic energy had emerged as a revolutionary new force. Given the circumstances confronting the Congress at the time, I think there are few who upon reflection will quarrel with me when I say that Congress chose well when it enacted the Atomic Energy Act of 1946 and created a civilian agency to develop the atom rather than maintaining it under military control.

It was always recognized, however, that the 1946 Act was temporary in nature. Accordingly in 1953, at a time when the United States had a large stockpile but no longer a monopoly in nuclear weapons, the Congress was able to consider devoting a portion of our nuclear capacity to civilian purposes, and to eliminate some of the secrecy in which our atomic energy program was enshrouded. As a result, the Joint Committee recommended and after long debate Congress enacted the Atomic Energy Act of 1954. Enactment of the 1954 Act marked the culmination of efforts by the Joint Committee and the Congress, in accord with the policy declaration of the 1946 Act, to update the basic statute so as to reflect the rapid advancement and broadened horizons of nuclear science.

The new Act marked a turning point—a shift in emphasis from solely military applications to an increasing emphasis on peaceful uses. This shift has continued to this day. As I think my later remarks will show, we are well along the path toward fulfilling the confidence expressed by President Truman in his October 3, 1945 message to Congress requesting the enactment of atomic energy legislation. President Truman said:

"Never in history has society been confronted with a power so full of potential danger and at the same time so full of promise for the future of mankind and the peace of the world. I think I express the faith of the American people when I say we can use the knowledge we have won, not for devastation of the world, but for the future welfare of humanity."

It is altogether fitting and appropriate, therefore, that President Johnson should commemorate the enactment of the Atomic Energy Act, as he did yesterday. Without objection, Mr. Speaker, I request that President Johnson's remarks be included in the record at the conclusion of my remarks.

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[1] Reprinted from the Congressional Record of Aug. 2, 1966 (daily edition), pp. 17078–17082.

My principal purpose for rising today is to commemorate a different, albeit related, anniversary. Specifically, I want to call attention to the fact that today's date—August 2, 1966—marks the 20th anniversary of the formal establishment of the Joint Committee on Atomic Energy. Twenty years ago today the newly appointed members of the Committee—nine from the House, nine from the Senate—gathered for their first meeting—the first of over 1500 meetings to be held over the following twenty years.

As I have indicated, the Atomic Energy Act of 1946 was unique in many respects. Not the least unique among its features was its creation of a Joint Committee of Congress to oversee the atomic energy program. The Joint Committee on Atomic Energy—one of the few committees of Congress established by statute rather than by rule of each House and the only Joint Committee empowered to receive and recommend proposed legislation, including authorization of appropriations—grew out of Congress' cognizance of and concern over the vast powers which were bestowed upon the Executive Branch of Government by the 1946 Act.

In this field of overriding importance to the national defense and of unlimited promise for the peacetime welfare of the Nation and the world, new legislative techniques were necessary. As President Truman remarked in 1945, "The release of atomic energy constitutes a new force too revolutionary to consider within the framework of old ideas." The Congress had to meet the challenge of atomic energy in a manner which would preserve and strengthen the structure of a Government which rests upon the foundation of separate and equal powers and at the same time assure that the Legislative Branch was equally as informed as the Executive Branch.

The instrument which Congress chose to span the separation between the Executive and Legislative Branches and to meet the special legislative needs imposed by the defense importance, the complexity, and the portent of atomic energy was the Joint Committee on Atomic Energy. The magnitude—both in terms of the management problem and the immense expenditure of public funds—of the atomic energy program, its technical complexity, and its security importance gave almost a new dimension to the normal responsibilities of a legislative committee. In recognition of these special responsibilities the Congress conferred upon the Joint Committee unusual powers—sufficiently unusual to make the Committee unique in Federal legislative annals.

The Joint Committee was established as the agent of the Congress and the American people, and is charged with the responsibility of making "continuing studies of the activities of the Atomic Energy Commission and of the problems relating to the development, use, and control of atomic energy." The Commission by law is required to keep the Committee "fully and currently informed," as is the Department of Defense with respect to all matters within its cognizance relating to the development, utilization, or application of atomic energy. The Committee has full hearing powers, including subpoena authority. The Committee members from each House report out bills or other legislative matter to their respective Houses. To promote bipartisan support, not more than five of the nine-member delegation from each House may belong to the same political party.

The obligation of the Atomic Energy Commission and the Defense Department to keep the Joint Committee fully and currently informed helps to assure a continuing flow of information necessary to the proper discharge of the Committee's responsibilities to the Congress. Visits by the Committee and its staff to AEC laboratories and other operating sites serve to further alert the Committee to the problems and promises of the atomic energy program. Continuity in Committee membership and the selection of a highly competent staff without regard to political affiliation have also enhanced the Committee's ability to cope with its responsibilities. Finally, the vantage point of the Joint Committee, separate as it is from the executive position of the Commission, has provided a degree of perspective such as to enable the Committee to make substantive recommendations which have been accepted by the Executive Branch.

The extent of the Committee's active involvement in the atomic energy program has been lauded by some, resented and criticized by others. The Washington Evening Star recently said that "The Joint Committee takes its duties seriously and cherishes its supervisory prerogatives fiercely." I for one was flattered by the statement and readily confess to the charge.

It has also been suggested by some that the Committee on occasion has encroached on the doctrine and practice of separation of powers; that what the Committee regards as its proper role in policy-making functions is in fact an assault on executive powers. I could dismiss this charge by simply noting that the Constitution contemplates *co-equal* branches of Government, not domination by

one—the Executive—over the other. But I cannot resist pointing out also the irony of the charge, coming as it does from some of the same critics who chastise Congress as a whole for not resisting the trend toward executive erosion of legislative power.

In view of the occasion, I do not think it inappropriate or immodest to reflect upon the history of the Committee and some of the accomplishments which the Joint Committee has helped to achieve during the last two decades. The list is one I am honored to recount.

I think you will find it an impressive one.

The paramount and primary objective of the national atomic energy effort, by statute and unflagging determination of both the Joint Committee and the Atomic Energy Commission, has been in support of national defense. This objective has been served without stint.

Our nuclear arsenal—if one could call it that—at the end of World War II was nonexistent. I mean that quite literally. The atomic bombs that fell on Hiroshima and Nagasaki on August 6 and 10, 1945 completely exhausted our supply at that time and our production capabilities were exceedingly limited.

As late as December 1946, shortly before the Atomic Energy Commission assumed jurisdiction over the atomic energy program from the Manhattan Engineering District, the weapons program was at a virtual standstill. A Commission representative who made an inventory of the weapons stockpile in that month later told the Joint Committee:

"I spent two days, as a representative of the Commission, going over what we had. I was very deeply shocked to find what few weapons we had at that time."

By the spring of 1949, however—little more than two years after the AEC had gone into operation—the Nation's leaders were able to take comfort in the knowledge that the country had what accurately could be described as a nuclear weapons stockpile. Later, as a result of the AEC's major rehabilitation and expansion programs, the country was provided a nuclear weapons capability in quality and quantity that to this day remains unmatched by any other nation.

The story of the development of our nuclear shield would be incomplete without some reference to the H-bomb. The possibility of developing a hydrogen bomb was explored by U.S. scientists as early as 1942. Studies concerning the feasibility of a hydrogen weapon were conducted as part of the wartime atomic project, although they were subordinate to work on the A-bomb since it was believed that the atomic bomb could be developed more quickly and could, therefore, be used to hasten the end of the war. At first, after the end of World War II, no substantial effort was directed toward the development of an H-bomb although a small research program on thermonuclear energy was continued.

This situation prevailed until September 23, 1949, when President Truman announced that the Soviets had exploded an atomic bomb. The Government promptly reviewed our atomic program in light of the generally unexpected rapid progress of the Soviets. As a result, for the first time, major attention was directed to the question of developing a thermonuclear weapon.

The Joint Committee on Atomic Energy took a leading part in urging the President to support a vigorous program on the development of hydrogen weapons. Between September 1949 and January 1950, the Committee held several hearings in executive session on this question. Over the signature of its Chairman, the late Senator Brian McMahon, five separate letters were forwarded to the President on behalf of the Committee urging a major development effort. Senator McMahon set up a special subcommittee to review the H-bomb matter of which I had the honor of being appointed Chairman.

Together with other subcommittee members, Mel Price, Henry M. Jackson and the late Carl Hinshaw, I visited Los Alamos in October 1949 and obtained first-hand information from our weapon scientists. We then went on to Berkeley California, where joined by Joint Committee member Senator William Knowland, we discussed with a great scientist—the late Ernest O. Lawrence—the fastest possible means of achieving a successful H-bomb program.

Based on what we had learned, the subcommittee recommended to Chairman McMahon that we move ahead at all possible speed with the H-bomb program. Chairman McMahon thereafter wrote several letters to President Truman, visited a number of atomic installations and together with a number of us from the Joint Committee personally called upon President Truman at the White House to urge a major crash program on the H-bomb.

After vigorous debate at the highest levels of Government, the situation that confronted the President was this: (1) a majority of the Atomic Energy Commission advised against proceeding with a large-scale and vigorous effort on develop-

ment of the hydrogen bomb; (2) the AEC's General Advisory Committee also advised against proceeding; (3) the Joint Committee on Atomic Energy favored proceeding; and (4) a special Subcommittee of the National Security Council favored proceeding, the Secretary of State and the Secretary of Defense recording favorable votes.

On January 31, 1950 President Truman made his decision and issued an order to the Atomic Energy Commission to proceed with the development of the hydrogen bomb. As the project progressed the Joint Committee renewed its urgings that every effort be made to attain the objective in the shortest space of time. The program was pushed with great vigor and achieved success. The value of the effort was proved less than a year later when the Soviets detonated their own hydrogen device.

The power of the hydrogen bomb is not a mere magnitude larger than the atom bomb used in World War II. It is three magnitudes larger, or 1000 times as powerful as the A-bomb. Imagine, if you can, a train of boxcars stretching from Boston to Los Angeles, each car filled with TNT. That, ladies and gentlemen, will give you come conception of the explosive content of a 20-megaton weapon.

In building these weapons we have not striven to produce the biggest bombs possible. On the contrary, we have reduced the yields of our hydrogen weapons as we have improved the means and accuracy of our delivery systems. Concurrently, we have improved the safety and security of our weapons.

Last January 17 a tragic airplane crash occurred over the Mediterranean Sea. Several of our Air Force men were killed and four hydrogen bombs fell out of the sky over Spain and its sea coast. Not one of those bombs produced a nuclear explosion. While we were fortunate that no one was harmed by the falling debris from the airplanes, it was not merely a matter of good luck that the bombs failed to produce a nuclear catastrophe. The safety devices which the Commission and the Department of Defense have built into these weapons to prevent unintentional explosions precluded any such accidental holocaust.

Equally important are the devices which safeguard against the possibility of unauthorized use of nuclear weapons, the need for which was brought to the President's attention by the Joint Committee.

In carrying out its responsibility to review activities in the vitally important field of atomic weaponry, the Joint Committee in the late 1950's became apprehensive about the arrangements for the custody and control of U.S. nuclear weapons assigned to NATO. Based on the knowledge of the practices and procedures then in effect concerning these weapons, grave consequences were foreseen by the Joint Committee in case of the unauthorized use or accidental detonation of these nuclear weapons.

Aware of the dangers inherent in this situation, in 1960 Senator Clinton P. Anderson as Chairman of the Joint Committee appointed a special Ad Hoc Subcommittee to investigate the matter. I was privileged to be named Chairman of this Subcommittee. Fellow Subcommittee members and I immediately visited eight European countries and more than 15 nuclear weapons installations. Early in 1961, as a result of our inspection, we presented a Top Secret report to President Kennedy containing recommendations designed to strengthen and improve our NATO nuclear weapons arrangements.

One of the key recommendations of this report called for the development of a system of electronic locks to be placed on nuclear weapons as a safeguard against unauthorized firing. This recommendation was accepted by the President and a research and development program was begun which ultimately resulted in the development of the Permissive Action Link system.

Numerous other recommendations were set forth in our report—many of them to this day must remain classified.

I can say however that at the time we were concerned with what appeared to be too great a reliance on nuclear weapons in NATO and an inadequate understanding amongst our allies and within our own forces of nuclear weapon effects. We recommended against any significant increase of nuclear weapons in Europe and that greater effort be made to increase NATO's conventional weapon capabilities. Additional recommendations, which subsequently were implemented, included coordination between NATO and SAC nuclear weapon war plans and the removal of Jupiter IRBM missiles from Italy and Turkey. A potential safety problem in an operational system was uncovered by a Joint Committee consultant and was corrected.

In speaking of the military aspects of atomic energy I have saved until last, one of the brightest chapters—the development of the nuclear Navy, particularly

the nuclear submarine. There is little question in my mind that the support which the Joint Committee and Congress gave to the development of the nuclear submarine will long be remembered as one of Congress' greatest contributions to the preservation of the Republic. On more than one occasion Admiral Rickover, the man who provided the day-to-day technical drive and organized leadership for the work, has referred to the essential part that the Joint Committee on Atomic Energy and the Congress played in this development.

At the time Admiral Rickover took the helm of this development project the Navy thought so little of it that they gave him no support to carry it out. The Congress recognized this impasse early in the program and stepped into fill the vacuum. Specifically, the Congress authorized facilities for the development work and provided funds for the operation of these necessary facilities. Later, when the Navy refused to seek the funds necessary to build a nuclear submarine Congress stepped in again and voted funds for the nuclear power plants for the first two nuclear submarines, the *Nautilus* and the *Seawolf*. Because of the Navy's reluctance the money was appropriated to the Atomic Energy Commission where it was used to build the power plants that were then turned over to the Navy Department. Through this circuitous route were built the first of the nuclear submarines which today constitute one of the mainstays of our national defense.

But for the intervention of Congress it is likely that Admiral Rickover's career in the Navy would have ended in 1953. At that time he was about to be passed over for promotion, an action which would have brought his Navy career to an end. Fortunately, many in the Congress, particularly the Joint Committee on Atomic Energy, came to his assistance. As a consequence, a reluctant United States Navy promoted him to the rank of Rear-Admiral in late 1953. Today the 66-year-old Vice Admiral is still on the job, rightfully acknowledged as the Father of the Nuclear Submarine.

In subsequent years, the Joint Committee has continued to recommend, and Congress has continued to authorize, facilities for the advancement of nuclear submarine and surface warship propulsion technology which were turned down within the Executive Branch in the budgetary review process. Congress has also added nuclear propelled surface warships to the authorization requests of the Department of Defense. After many years of trying to convince Department of Defense leaders of the value of nuclear propulsion in warships, it appears that this year we are realizing for the first time the results of our efforts. This year's authorization bill, due to some modifications by the Congress in the request of the Department of Defense, contains nuclear propulsion for all first-line warships.

Until not too long ago the much publicized military atom captured the lion's share of the headlines. Of late, however, the peaceful atom has more than come into its own. In no area is this more true than in the use of atomic energy to produce electrical power.

The development of nuclear reactors for the conversion of atomic energy into useful, economical power has been the goal toward which the United States has worked since the day in 1942 when the first nuclear chain reaction in the uranium graphite pile was achieved under the west stands of Stagg Field at the University of Chicago. If the recent dramatic upsurge in orders for nuclear power plants is any indication, that goal is now within our grasp.

In the last 18 months more than 11 million nuclear-generated kilowatts have been announced by the utility industry as scheduled to enter into commercial operation by 1970. In the last 6 months alone, approximately one-half—or more than 13½ million kilowatts—of the total generating capacity ordered by the utility industry has been nuclear fueled. These plants are expected to be in operation by 1973. The rate at which atomic reactors are being purchased has caused the Atomic Energy Commission to double the estimates it made just four years ago, when in its 1962 Report to the President the AEC foresaw a nuclear generating capacity of 40 million kilowatts by 1980. The Commission currently believes that installed capacity by 1980 will be somewhere between 80 and 110 million kilowatts.

For those in industry and Government who have labored long and hard in the vineyard to bring to the American people the fruits of power from the atom, these statistics are certainly encouraging. We now have available to us a vast new energy source in addition to fossil fuels to meet the Nation's ever-increasing power requirements. The magnitude of this feat takes on even greater meaning when it is recalled that this country had no installed commercial nuclear electrical generating capacity until 1957, when the Shippingport nuclear reactor first went

into operation. But for Congress, moreover, Shippingport might never have gotten off the drawing boards.

In the fall of 1952, the AEC proposed to the Bureau of the Budget that it include some construction money in the fiscal 1954 budget to enable the Commission to begin building a full-scale power reactor. The Bureau of the Budget refused the request on economy grounds. The Commission then proposed to the National Security Council that money be included in the revised fiscal 1954 budget for beginning construction of a pilot plant to produce 7500 kilowatts of electric power. The National Security Council also turned this proposal down, again on grounds of economy.

When the President's budget message was submitted to the Congress, the Joint Committee was concerned to learn that the proposed budget for atomic energy contained no provision for the development of a full-scale atomic power plant. Private industry had made it abundantly clear to the Committee that it was prepared to invest in the development of an atomic power station if the Government would underwrite part of the cost and if the necessary amendments to the Atomic Energy Act of 1946 could be obtained. The Joint Committee deemed it essential, therefore, that the Commission be granted the funds with which to proceed with the development, design, and construction of such a power plant.

Accordingly, W. Sterling Cole, the then Chairman of the Committee, conferred with the Members of the House Appropriations Subcommittee charged with responsibility in this area, and discussed the implications for the future of atomic power if the Government failed to press forward with the development of a full-scale atomic power plant. The Appropriations Subcommittee responded by sponsoring language in the Appropriation Act, language which was approved by the Full Committee, authorizing the Commission to spend $7,000,000 during fiscal 1954 to begin construction of the Shippingport nuclear facility in cooperation with private industry.

The 60,000-kilowatt project, built in cooperation with the Duquesne Power and Light Company and the Westinghouse Electric Company, was a complete success. In every way, it justified the confidence which the Congress had reposed in it and the people who built it. This, the first practical demonstration of the technical feasibility of using nuclear energy for full-scale protection of power, was truly the catalyst for today's atomic power boom.

While the use of atomic energy for the production of power is perhaps the most glamorous use of the peaceful atom, it is, of course, only one of the varied adaptations of the atom. Radioisotopes, for example, have for some time found widespread application in industry, in medicine, and in agriculture. In recent years the volume of radioisotopes transported throughout the United States has been averaging about 250,000 shipments per year. At the end of 1965, there were in existence in the United States over 14,000 licenses issued to individuals and corporations authorizing the possession and use of radioactive materials.

One application of radioisotopes which has been of special interest to the Joint Committee has been the preservation of food by radiation. The Atomic Energy Commission is carrying out a program on the preservation of food by subjecting it to low dose or pasteurizing levels of radiation. This permits extension of shelf-life for marine products and certain fruits and vegetables. The Department of the Army has focused its attention on the radiation sterilization of food products, especially meats which can then be stored for long periods without refrigeration.

Work on this promising concept was proceeding at a steady pace during the late 1950's. However, during Joint Committee hearings held in January of 1960 it became apparent that the Department of the Army for all intents and purposes was about to discontinue its food irradiation program. The reason given was that certain unfavorable experimental data had developed during animal feeding studies.

The Joint Committee then scheduled additional hearings and heard detailed testimony from scientists and medical specialists actually carrying out the research program. It turned out that the data cited were not attributable to irradiation effects on the food products under study. Later, additional tests were carried out which conclusively confirmed this conclusion. Through the interest of the Joint Committee and the urging by its members the food irradiation program, which was to be phased out, was instead continued and expanded and a better coordinated AEC-Army program research effort was undertaken.

The Food and Drug Administration has now approved for public consumption irradiated bacon, wheat and wheat products and potatoes. Additional food products are before the Food and Drug Administration and others are being proof-tested.

The food irradiation research program is a small one. Nonetheless, the potential that this process holds not only for food processing in this country but throughout the world is great. When fully developed, the process should result in significant savings in marketing costs and more efficient utilization of the available food supply.

In addition to the attributes that radioisotopes possess for use in research and industry, one can take advantage of the fact that when a radioisotope decays, it generates heat. The Atomic Energy Commission has developed shielded units containing high concentrations of radioisotopes which generate heat. This energy is converted to electric power for use in space and other applications. Such units are in use today in satellites now orbiting the earth, navigational buoys, and in remote weather station units. The space power application for radioisotopes is an important one since rather compact, light-weight units can be made which will generate electric power for considerable periods of time, equivalent to that which would be produced by many tons of batteries or through the use of many thousands of solar cells displayed in huge panels attached to a space satellite.

One such device was lofted into space in 1961—the world's first nuclear-powered satellite. Still orbiting and operating five years later, the navigational device utilizes an isotopic power supply for its electricity requirements. This pioneering launch into space, I might note, came very close to never taking place. There were those who resisted the experiment because they felt a proof test was unnecessary, or because it might cost an undue amount of money. Vice-President Lyndon B. Johnson, however, disagreed, and threw the support of the President's Space Council behind the Joint Committee's proposal to put the satellite in a test. It is no exaggeration to say that the success of the experiment broke the chains of power limitations in space.

Another example of the generation of electricity by atomic energy for use in space application was achieved in 1965. In April of last year the first nuclear reactor was orbited about the earth in a satellite containing a number of scientific experiments. This reactor, the SNAP–10A, generated 500 watts of electric power for a period of 43 days following the launch. A failure, not in the reactor but in the electrical load distribution system, was apparently responsible for termination of the electric power generation.

I think it is important to note here that although the Administration did not plan a test of the SNAP–10A reactor in the space environment, the Joint Committee on Atomic Energy believed that such a test was highly desirable and could be conducted successfully at a reasonable cost. For this reason the Committee recommended authorization of funds for the conduct of a test in space and the Congress, acting on the Joint Committee's recommendation, authorized and appropriated the necessary funds. The test was successful in that it demonstrated the ability safely to launch, start-up and operate a reactor in space—an important first in the U.S. space effort.

Not to share is foreign to the creed of the American people. Accordingly, on December 8, 1953, President Eisenhower presented to the General Assembly of the United Nations his historic "Atoms for Peace" plan, which embodied the nation's desire and willingness to join with all other nations in a common undertaking directed toward the peaceful development and constructive exploitation of atomic energy. The popular appeal of directing atomic materials to peaceful rather than military uses was fully established by the enthusiastic world-wide response to the proposal.

Out of that proposal emerged the International Atomic Energy Agency, conceived as an instrument for enabling East and West to work together on technical and economic problems apart from the arena of political conflict. The Agency statute, approved by the United States in 1957, was a singular achievement, for it embodied the first significant agreement between East and West directly related to the arms limitation problem. The Agency has served to siphon off atomic materials from military to peaceful uses and, more importantly, to establish a system of international safeguards against the diversion of nuclear materials to military purposes.

A number of nations have found the International Agency a source of help essentially neutral in the East-West conflict. To assist these nations we contribute equipment and material to the Agency for distribution as it sees fit, subject, of course, to Agency safeguards. Many others have chosen to deal directly with the United States in obtaining the materials, equipment and technology required for peaceful atomic applications. Where this has been the case the Joint Committee has strongly encouraged the AEC and the Department of

State to insist that any assistance furnished on a bilateral basis be subject to international safeguards. Similarly, where bilateral agreements entered into prior to establishment of the Agency have come up for renewal the Committee has fully supported the policy, and at times has had to insist upon the policy, of transferring our Government's safeguards responsibilities to the Agency.

Some of the nations with whom we have cooperated have balked at the transfer of these responsibilities to the International Agency, preferring instead that the United States itself perform the safeguards task. They seem to feel that IAEA inspection is a badge of second-class citizenship in the nuclear world. It is important, however, that we continue to expand the international inspection system and improve our control methods to guard against the dangers to world peace posed by nuclear weapons.

Of the 32 bilateral agreements for cooperation in the peaceful uses of atomic energy presently in force, 27 provide for or contemplate the transfer of safeguards responsibilities to the International Atomic Energy Agency. In addition, the U.S. has voluntarily placed four of this country's reactors, including the large privately-owned Yankee power reactor at Rowe, Massachusetts, under international safeguards. Meanwhile, the U.S. has since 1957 supported the IAEA in the amount of $28.5 million in the form of cash and grants in kind. Through these policies we believe a vigorous, experienced and respected International Agency will evolve whose control system will be administered strictly and impartially and with a minimum of injury to national pride.

There have been occasions in the past when the AEC or the Department of State were willing to accommodate the resistance of some foreign countries to International Atomic Energy Agency safeguards. The Joint Committee, however, insisted upon compliance with the announced U.S. policy of IAEA or similar international safeguards and succeeded in strengthening the Executive Branch in its foreign negotiations.

Also, over the years there have been those who have advocated transferring nuclear weapons and weapon technology to other nations. The Joint Committee has steadfastly resisted actions that would increase the proliferation of nuclear weapons to additional nations, either directly or indirectly. Thus in 1958 the Joint Committee substantially revised proposed legislation submitted by the Executive Branch to assure that the legislation would not permit additional nations to achieve independent nuclear weapon capability through assistance from the United States.

Notwithstanding criticism that we have placed undue restrictions on the Executive Branch in the exchange of nuclear technology and information for military purposes with other nations, the Joint Committee, in recognition of its responsibilities to the Congress and the people, has insisted that it be kept "currently and fully informed" and that no cooperation be entered into with other nations unless first carefully reviewed with the Committee in light of the legislative intent of the Atomic Energy Act and to the extent security will permit that it be reviewed in public. We particularly have resisted for many years repeated efforts by those who all too willingly would turn over to other nations the secrets of our nuclear submarine and surface warship technology.

That, Mr. Speaker, completes my relatively brief reflection upon the history of the Joint Committee on Atomic Energy, which has now operated for twenty years. In conclusion, I want to say that the Committee has been ever mindful of and constantly striven to act in consonance with its responsibilities and powers and its proper limitations and restraints. It has attempted to serve the Congress in the manner demanded by the needs of our country and consistent with the duty and honor of the elected representatives of the people of the United States.

As President Woodrow Wilson noted in his early study of the Congress, "Congress in its committee rooms is Congress at work." I think it is fitting and proper, therefore, that the public be informed of the work of the committees of Congress so that the people may better understand and realize the accomplishments of the Congress. That has been my purpose today.

What the next twenty years will bring is another story. While no one can predict the next two decades with any full degree of accuracy, some obvious conclusions can be drawn. I will reserve for some future occasion some thoughts I have concerning what we can expect to accomplish in the next twenty years.

APPENDIX 11

ADDRESS BY DR. GLENN T. SEABORG, CHAIRMAN, USAEC, BEFORE BRITISH NUCLEAR ENERGY SOCIETY AT CHURCH HOUSE, LONDON, ENGLAND, OCTOBER 24, 1966

NUCLEAR POWER—TWO YEARS AFTER GENEVA

I am especially pleased to have been asked to give the 1966 Annual Lecture of the British Nuclear Energy Society, and honored to join the ranks of those who have spoken to you in previous years. This platform has seen and heard a distinguished group of men—Lord Sherfield, whom I know as my good friend Sir Roger Makins; Dr. Sigvard Eklund, the Director General of the International Atomic Energy Agency; Dr. W. Bennett Lewis, Senior Vice President of Atomic Energy of Canada, Limited; and Sir John Cockcroft, one of the truly outstanding British scientists and a real pioneer in nuclear energy.

In considering a subject for this evening's address, I naturally reviewed the topics of the Society's previous annual lectures. On this basis I was encouraged by some of my associates to speak on the nuclear power program in the United States—a reasonably simple and relatively noncontroversial subject for me. But I know full well that when one gets a few thousand miles away from the United States its immediate nuclear power plans and program are not the most exciting thing one might talk about. Going contrary to the good advice I received, I thought it might be more appropriate for me to broaden my perspective this evening and consider nuclear power from a more international viewpoint. I recognize the risks entailed when one quotes facts and figures about someone else's nuclear program. However, I have tried to do my homework accurately and hope that we will be in agreement on most of the ideas I would like to present.

During the next hour I plan to build upon the summing-up statement I gave a little over two years ago at the close of the Third Geneva Conference on the Peaceful Uses of Atomic Energy and attempt to review worldwide energy needs and resources, more specifically those of *nuclear* energy, to examine the current status of reactor technology and finally to take a look at what lies ahead of us in the development of more advanced nuclear power reactors.

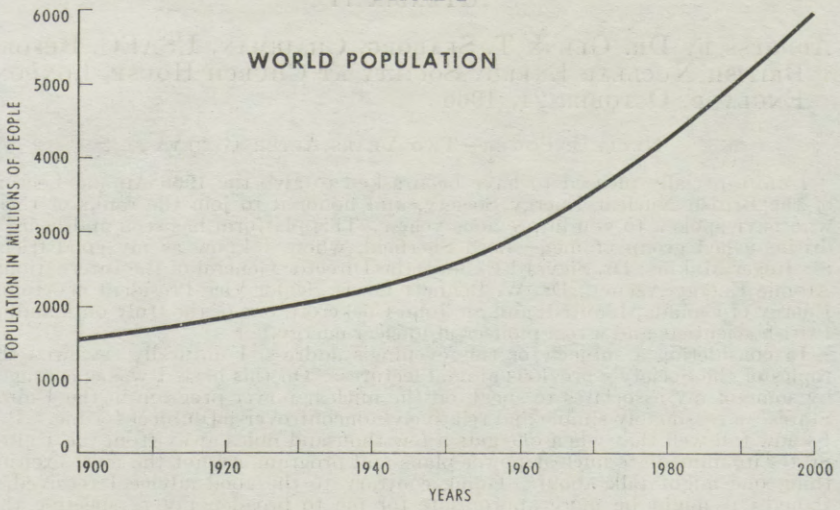
For the most part, I will rely on published figures relating to the performance and economics of the various reactor types. As a result of this, I will have to give some unintentional slight to the Soviet Bloc developments since it is difficult to transpose their economics into those with which we are generally familiar.

The analytical approach I shall use for the most part this evening is a rather simple and straightforward one. In almost every instance I will consider reactor systems and their concomitant economics in terms of one variable—that is, a one dimensional analysis and a very simple one at that. I considered for a while trying to present a more precise, detailed and technological exposition, but soon realized that my time would be insufficient this evening to discuss the matter so fully.

I wish to make one further caveat—and that relates again to the facts and figures I shall be presenting this evening. Each number is not meant to be statistically significant to the seventh digit. In fact, I have intentionally rounded many of them off in order that no one will decide to make a significant programmatic decision on the basis that one reactor type was said to be a tenth of a mill more or less costly than another reactor type in tonight's address. By the way, I hope you will also bear with me in my use of mills and American dollars rather than their British equivalents. I believe that if I attempt tonight to translate the currency at the same time that I am interpreting the technology involved, we will all be more confused than enlightened by the end of the evening. With all this as a prelude, let me strike boldly forth to the substance of my talk—"Nuclear Power—Two Years After Geneva."

Before one can discuss the future of power with any realism one must first talk about people—people in terms of population and the ever-growing pressure of population. This is a subject of overwhelming importance today, and I am sure that you are all familiar with the information in the first figure (#1) showing the exponential growth of the world's population projected to the year 2000. The curve on this graph bears a simple but most relevant message—that between the year 1960 and the year 2000—within the lifetimes of many of those in the

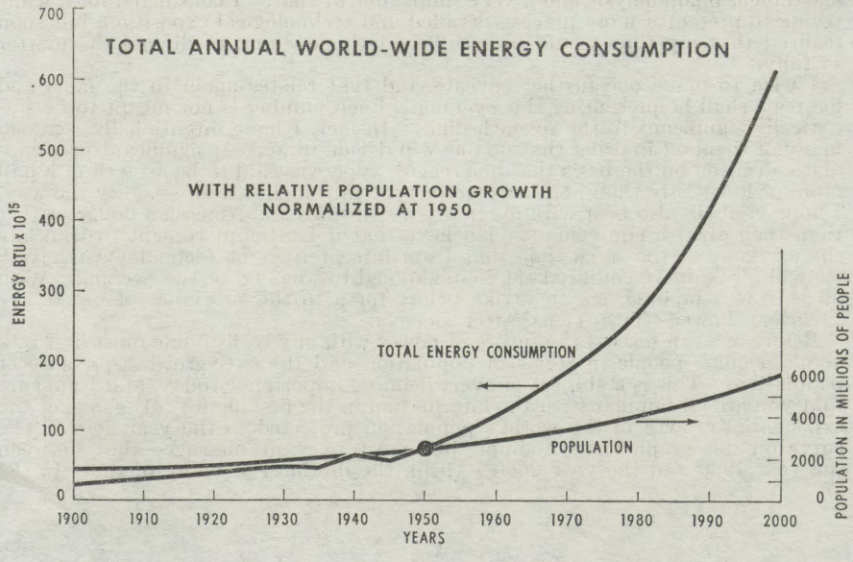
FIGURE 1



audience—the world's population will about double. It will rise from three billion or 3,000 million, to six billion, or 6,000 million people. Now if all the other aspects of civilization as we know it were to remain the same and proportionally each individual consumed the same amount of energy tomorrow as today, the energy demand should also double.

But we know that this will not be the case and the second figure (#2) shows the actual situation. This graph of past and projected annual worldwide energy consumption covers the same period as the previous population curve. The previous curve, normalized to the worldwide energy consumption curve at the year 1950, has also been included for comparison's sake. This makes obvious the fact that the consumption of energy by individuals does not have a constant value. In highly technological societies such as the United States and the United Kingdom, there has been and will be a significant increase in energy consumption per capita. In the emerging nations, however, there probably will be a startling increase. The consumption of energy in these countries today is almost nil

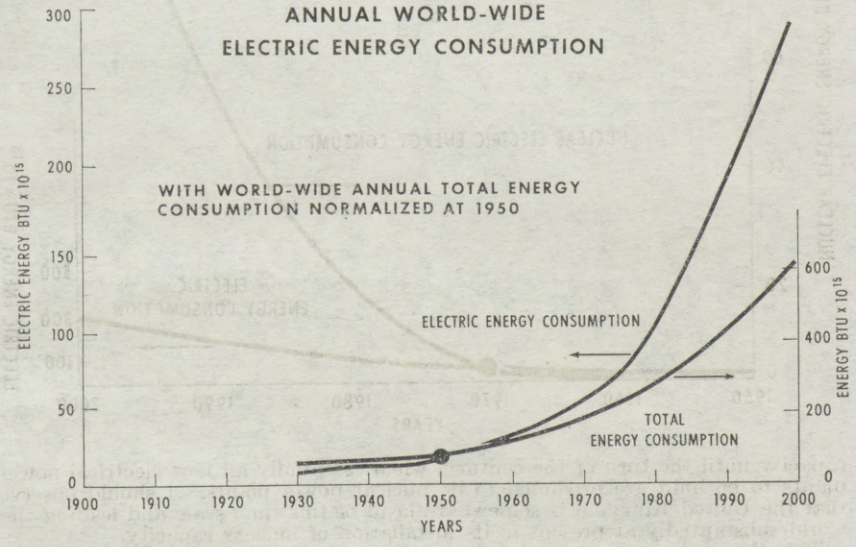
FIGURE 2



compared to what it might be tomorrow. It is difficult to comprehend fully the energy demands of a world of double today's population, all of whose people enjoy living standards approaching those of the people of the U.K. and the U.S.A. Think of the magnitude of energy that may be required some day if we were to air-condition much of Africa and the sub-continent of Asia and heat population centers that will be growing up in sub-Arctic regions. What would it mean to provide the power required to transport people and materials to the remote parts of the globe to satisfy the needs of an ever-expanding population, and provide sufficient power and fresh water for home, industry, and agriculture? Imagine the future energy needs involved in growing, processing and distributing food, from land and sea, for a world population double that of today—and demanding an adequate diet for all. These are only a few of the energy challenges we face.

Now recognizing the great importance of energy for future global social and economic well-being—perhaps for our very survival—let us talk about one important form of energy—electricity. The past and projected worldwide annual electricity production is represented in the next figure (#3). Again, the worldwide annual energy consumption as shown in the previous figure has

FIGURE 3

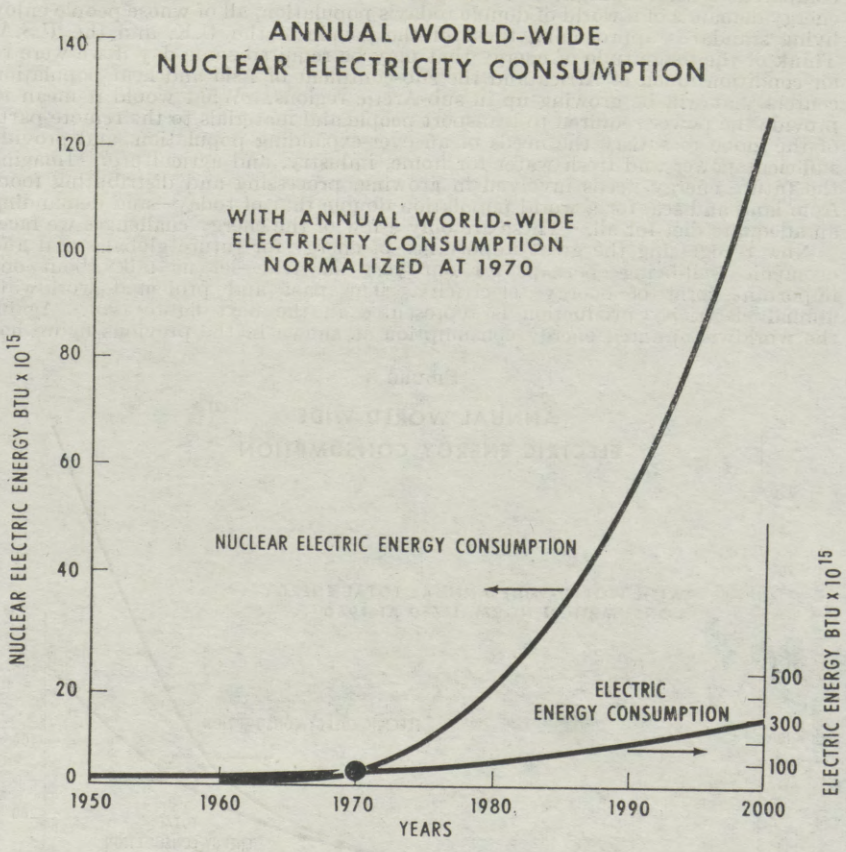


been normalized to the worldwide electricity production curve at the year 1950 and projected to the year 2000. I believe it is particularly evident that electricity will provide an even greater fraction of the energy consumed by man in the ensuing decades than it does today. This should not be a surprising fact when one realizes that many parts of the world are just being ushered into the Electric Age. Further, electricity is a particularly easily managed form of energy—simply transported by wire, conveniently and economically generated in large blocks, and capable of being produced from a number of independent energy sources—that is, hydro, fossil fuels, or the heat generated from nuclear fission. It is electricity produced by this last means that I would like to turn to next and examine in some detail.

In general, the future of nuclear electric power looks bright indeed, but we who are in this field know that we have many obstacles to overcome and that much hard work remains ahead of us to make the most of the atom's great potential power.

When we look at the nuclear electrical production throughout the world from the year 1950 to the turn of the century, as seen in the next figure (#4), again we see a familiar pattern of rapid exponential growth. In this case because of the newness of this energy source—nuclear generating capacity was clearly zero in 1950—the annual worldwide electricity production curve has been normalized to the worldwide nuclear production curve at the year 1970. It is generally agreed that nuclear energy will take an ever-increasing share of the electrical generating

FIGURE 4



capacity until the turn of the century, when essentially all new electrical power plants to be built are predicted to be nuclear power plants. I should observe that the United Kingdom is somewhat ahead of this time scale and leading the world substantially at present in its installation of nuclear capacity.

This then brings us to the importance of nuclear power—a point of which I am sure many of you are already acutely aware. As I indicated before, a rapidly expanding global population, its increasing appetite for energy and the satisfaction of an increasingly larger share of this energy appetite by electricity make nuclear electric power a key element in the future well-being and progress of man.

Assuming continued improvements in nuclear power technology, very large-size plants, and the absence of certain financial restraints, nuclear power has the potential for a significant reduction in the cost of electricity. A reduction large enough to cause rather dramatic changes in energy utilization is foreseen by some. There is no doubt that large-scale, very low cost sources of energy will determine more than any other single resource the availability and cost of other basic resources such as food, water, and industrial materials. With very low cost power, desalted water would be a reality. Our nitrogenous fertilizers and many of our basic chemicals would be produced by new routes and from raw materials such as water, air and coal. Electricity would widely be used to reduce most ores to metals. The world of tomorrow will certainly be far different from that of today if these promises of very low cost nuclear power do come true.

There are, I might add, other obvious advantages to nuclear power today. It is a clean source of power and does not add to the burden of pollution in the air. It is relatively independent of geography because of the extreme compactness and long life of nuclear fuels and therefore nuclear power plants can be constructed far from their sources of raw material—uranium and thorium ores—without a

significant economic penalty. And finally, it lends itself well toward generation in large blocks of power so that enormous, very economical, central power stations can be built.

But if nuclear energy is actually to be used in this very important role it must be capable of meeting at least two criteria. First, it must be economic wherever it is used. Otherwise nuclear power stations will not be built in any significant numbers. Second, sufficient reserves of nuclear fuel must be available to provide the enormous amounts of energy which will be required—not only through the year 2000, but also beyond, as our energy consumption ever increases.

Turning now to the present status of nuclear power in the world, let me point out that the types of reactors being constructed throughout the world today are being built for current and near-term economic use and their design does not in general take into consideration the long-term future resources of nuclear fuel. At present this long-term concern is really not a necessary condition of reactor construction because nuclear energy represents but a minor fraction of the annual global energy consumption and uranium resources are ample to meet near-term requirements.

The main thrust of today's reactor types is, of course, economics, and there is justification for this. As is generally known, the current reactor types have achieved economical competitiveness—remarkably so in countries such as the United States. In fact, in my tenure as Chairman of the U.S. Atomic Energy Commission I have witnessed a remarkable evolution of nuclear power. When I first took office the entire program was questioned on the ground that the expenditures of vast sums of public funds seemed to be for naught—that nuclear power would not be economic for several decades to come. Today I find some people at the other extreme beginning to question whether any additional government funding of advanced nuclear power programs is necessary, since so many nuclear power plants are being sold by the nuclear industry that the industry has reached the point of being self-supporting. In the United States alone, firm commitments for the construction of nuclear power plants went from 2,000,000 kilowatts in 1963–64 to 5,000,000 kilowatts in 1965 to 15,000,000 kilowatts for the first nine months of 1966. A similar increase in reactor construction is expected to occur in other countries.

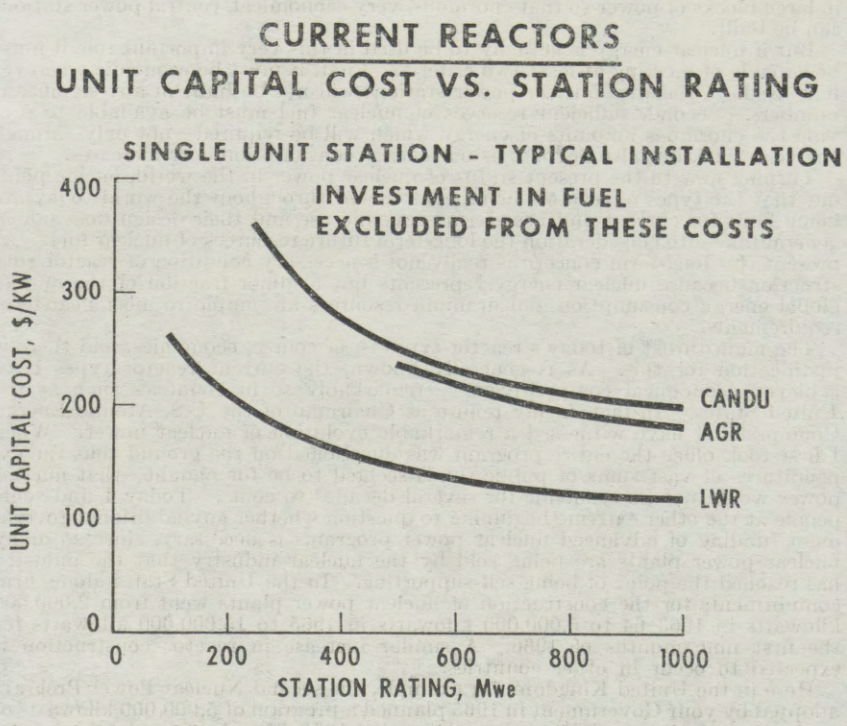
Here in the United Kingdom, for example, the second Nuclear Power Program adopted by your Government in 1965 planned a program of 5,000,000 kilowatts of nuclear generating capacity during the period 1970–75. As a result of selection of the AGR, this program was increased from 5,000,000 to 8,000,000 kilowatts by the end of 1975.

The French civil program, as another example, is the largest in Continental Europe. According to the French Government's "Fifth Plan" (the V Plan), the French foresee 2,500,000 to 4,000,000 kilowatts installed from 1966 to 1970 utilizing gas cooled, graphite moderated and natural uranium fueled plants of 500,000 kilowatts or more. At the present time, about 1% of France's electrical energy is of nuclear origin; by 1970, it is expected to reach 5%; and by 1975, 12%.

The installation of nuclear power in Japan is expected to total from 4,300,000 to 5,300,000 kilowatts by 1975, and approximately 10,000,000 kilowatts by 1980. Seven central stations are in various stages of planning in Japan, with two plants now operating. Sweden also plans a long range construction program of six nuclear power plants totalling 2,500,000 kilowatts of power by 1978. In the Federal Republic of Germany, two plants are now producing electricity, two are being built, and plans are going forward on several others. It is apparent that nuclear power will have a rapid growth in Germany during the next decade. Canada, India, Italy, Switzerland, and Spain also have substantial nuclear power plans.

One of the reasons given for this abrupt change in events has been the ability of the electric producers to begin utilizing very large blocks of electrical generation. As a result, it has become possible to take advantage of the savings incurred through scaling nuclear power plants to very large sizes, as can be seen in the next figure (#5). Some measure of these savings is obvious if we compare the three current types of nuclear power reactors—the light water reactors (LWR), both pressurized and boiling water, and the gas cooled reactor, specifically the advanced gas cooled reactor (AGR), and the heavy water moderated and cooled and natural uranium fueled reactor (CANDU). The unit costs reflected by these examples are those for the capital costs associated with construction and exclude the investment required in fuel. From these curves, and in particular from the light water reactor curve, one can see that while a 200 megawatt light water plant might cost $200 a kilowatt to construct, a 1000 megawatt plant would cost only

FIGURE 5



about $120 per kilowatt to construct. Another well-known point brought out by this chart is the fact that the AGR and CANDU reactors, which have relatively inexpensive fuel costs, are somewhat more expensive to construct than the light water reactor which conversely has a somewhat more expensive fuel cost. I should also add that these cost data represent the unit construction costs for these reactors in the country of their development. The heavy water reactor costs are those for construction of a reactor in Canada. The light water reactor costs are those for construction in the United States, and the AGR costs for construction are those for the United Kingdom. I felt it somewhat beyond the scope of this evening's address to attempt to place these on any more of a common basis, and in essence, redo the rather extensive and detailed efforts contained, for example, in the Dungeness-B Evaluation Report.

A similar caveat applies to the next figure (#6) which compares in tabular form the three reactor types for which data were given in the previous figure, at a common size of 1000 electrical megawatts. This table shows both a capital cost component and an operating cost component. The relationship just mentioned a moment ago between light water reactors with relatively low capital cost and high operating cost, and the AGR and CANDU reactors with relatively high capital cost and low operating cost, is again clearly evident. In these data, fuel inventory charges are set forth in the fuel working capital component of capital cost rather than in the fuel component of operating cost.

Certainly, all three reactor types are economically competitive in specific areas of the world. One has only to note that they are being contracted for and that they are being built. And, I might add, in considerable number.

Now, from an international perspective what determines whether a nation will build one or another of these reactor types? One of the most important factors in the decisional process leading to a choice of reactor type is the cost of money to be borne by the operator, or, more broadly, the fixed charge rate applied by the operator of the facility to convert capital costs into annual fixed charges. This rate can vary widely from country to country. The fixed charge rate does, of course, include many factors—the larges of which for private financing is usually the cost of money (i.e., interest rate). Other factors include depreciation, which varies depending on the period of plant amortization chosen, the provision for interim replacements, insurance and taxes.

FIGURE 6

CURRENT REACTORS

CAPITAL AND OPERATING COSTS

1000 Mwe STATION

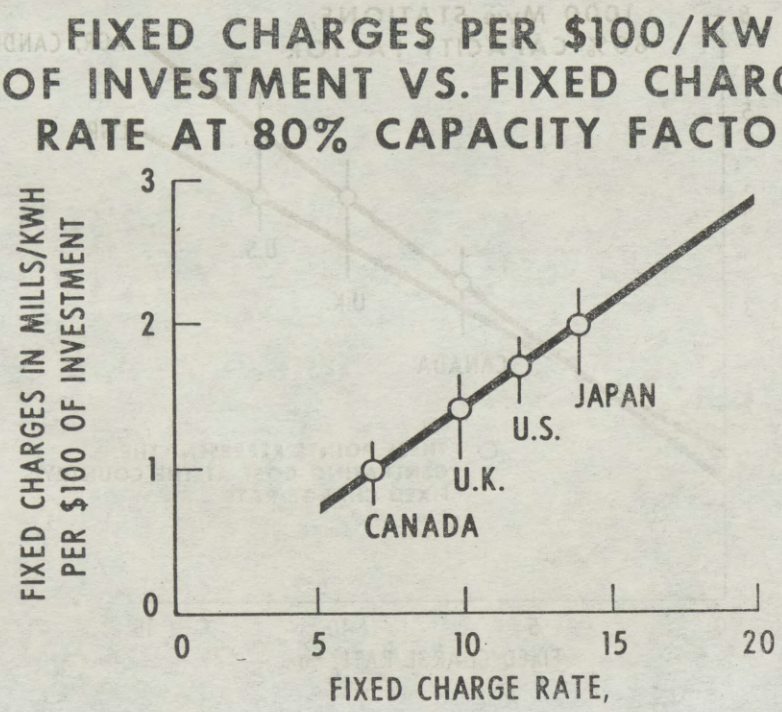
	LWR	CANDU	AGR
CAPITAL COST, $/KW			
PLANT	120	200 (1)	180
FUEL INVENTORY (2)	35	10	35
	155	210	215
OPERATING COST, MILLS/KWH			
FUEL (EXCLUDING CARRYING CHARGES) (2)	1.2	0.8	0.9
OPERATION, MAINTENANCE, AND INSURANCE	0.3	0.4	0.3
	1.5	1.2	1.2

(1) INCLUDES HEAVY WATER INVENTORY

(2) BASED ON NATURAL URANIUM AT $8/LB. U_3O_8 AND SEPARATIVE WORK AT $30/KGU

There clearly is no unanimity on this matter, as shown in the next figure (#7). This figure presents the fixed charges in mills per kilowatt hour for various fixed charge rates for each $100 per kilowatt investment. Here you can see that in Canada, with an annual fixed charge rate commonly applied there, $100 per

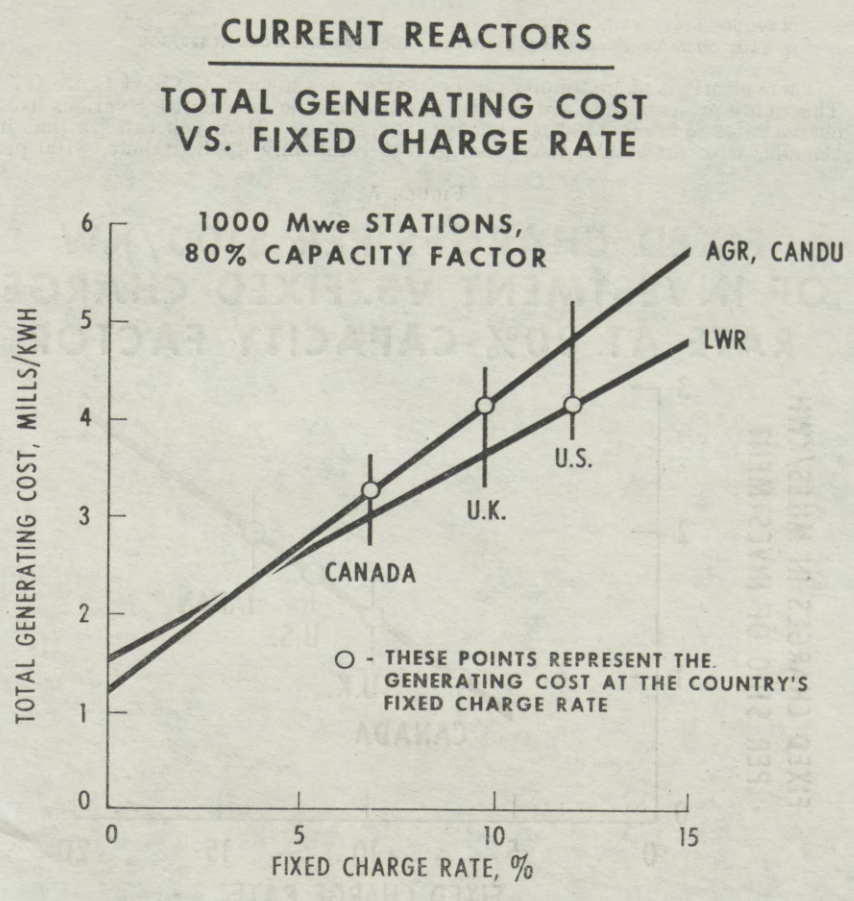
FIGURE 7



installed kilowatt would amount to about 1.0 mill per kilowatt hour in fixed charges. In the United Kingdom, this figure would be about 1.4 mills; in the United States, about 1.7 mills per kilowatt hour and in Japan about 2.0 mills per kilowatt hour. When one realizes the effort given to reducing the operating cost a few tenths of a mill—especially those costs associated with the fuel and fuel cycle—you can see how significant the country-to-country variation in the fixed charge rate can be. This variation can lead to power cost differences as much as one mill per kilowatt hour for every $100 of investment. And even a one-tenth mill increase per kilowatt hour is not an inconsequential increase. At today's level of electric power generation, this would cost the world on an order of an additional $350,000,000 per year and by the year 2000 the added cost of one-tenth mill per kilowatt hour would have risen to $3,400,000,000 per year. In the extremes noted in the figure, the fixed charges vary almost by a factor of two in going from Canada to Japan—that is, go from 1 to 2 mills per kilowatt hour for every $100 per kilowatt of investment.

The next figure (#8) amplifies the importance of the previous figure. It illustrates the total generating cost, including both the operating cost, which is independent of the fixed charge rate, and the total capital cost including the fuel working capital, which is of course dependent on the fixed charge rate. This has been done for each of the three current reactor types, again based upon a thousand megawatt generation station. I believe this makes clear why the heavy water moderated and cooled reactor and the AGR appear more economic in countries where fixed charge rates are low, and why the light water reactors appear more economic in countries like the United States, where the fixed charge

FIGURE 8



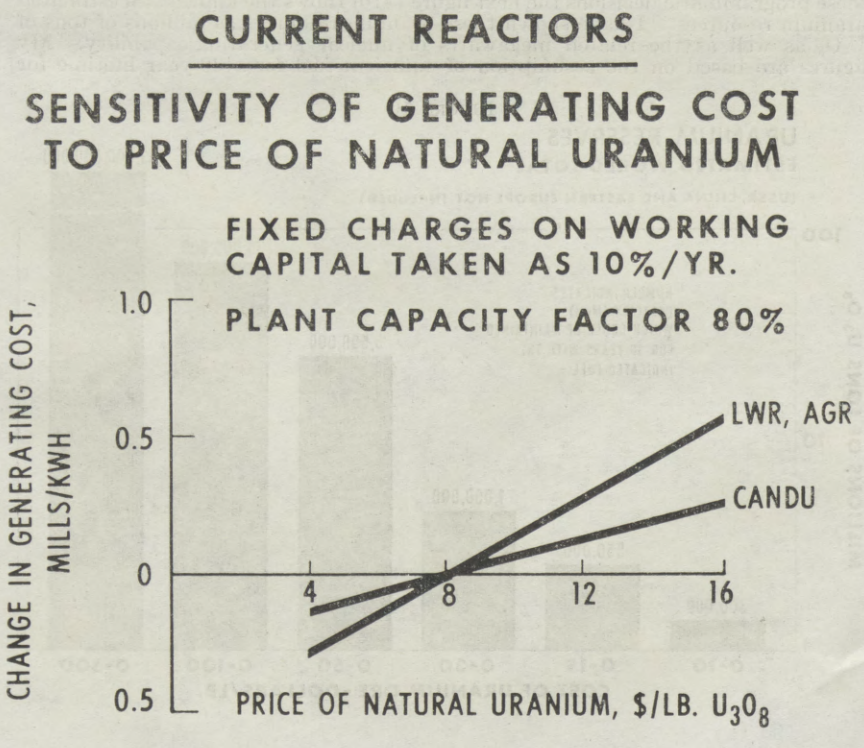
rates are higher. Again I must mention that these curves are for construction and operation of these reactor types in their respective countries, and their accuracy is probably not sufficient to fix the cross-over point of the two curves in the figure as precisely as is shown. I would imagine that if one were to construct a light water reactor and an AGR reactor in some third country the economic difference represented by the distance between these AGR and light water curves might not be anywhere as large as indicated.

I am sure you have realized that up to this point I have been treating in an overly simplified way the economics of nuclear power using only one variable—that of the fixed charge rate. Obviously the real world is far more complex than this and there are many other variables or uncertainties which must be taken into account in any decisional process. Some of these variables, such as construction cost due to variation from country to country in the cost of labor or materials, have a tendency to balance themselves out somewhat from one reactor type to another. Others do not. Of those that do not, one important variable is the price of uranium—the basic fuel for these reactors. This will affect both the operating cost, which is independent of the fixed charge rate, as well as the capital cost. In the latter case, the price of uranium is reflected in the working capital tied up in fuel inventory.

So far during this evening's presentation I have assumed a fixed price of uranium equal to $8 per pound of U_3O_8. This has been a general level which has been attained through extensive national and international procurement of uranium ores over the past decade. Recently, prices a few dollars below the $8 level have been negotiated due to the temporary surplus of uranium ore supplies. However, if one views this question of uranium ore resources from a long-term viewpoint the price will probably slowly escalate as the higher grade ores are consumed and as the general cost of labor and materials increases. For the present moment the figure of about $8 a pound of U_3O_8 is a fair and perhaps a somewhat conservative one not likely to change drastically for the next decade.

Nevertheless, a careful examination of the current reactor types from the viewpoint of the future abundance or scarcity of natural uranium supplies—as reflected in their market price—is an obvious next step. In the next figure (#9) we have

FIGURE 9

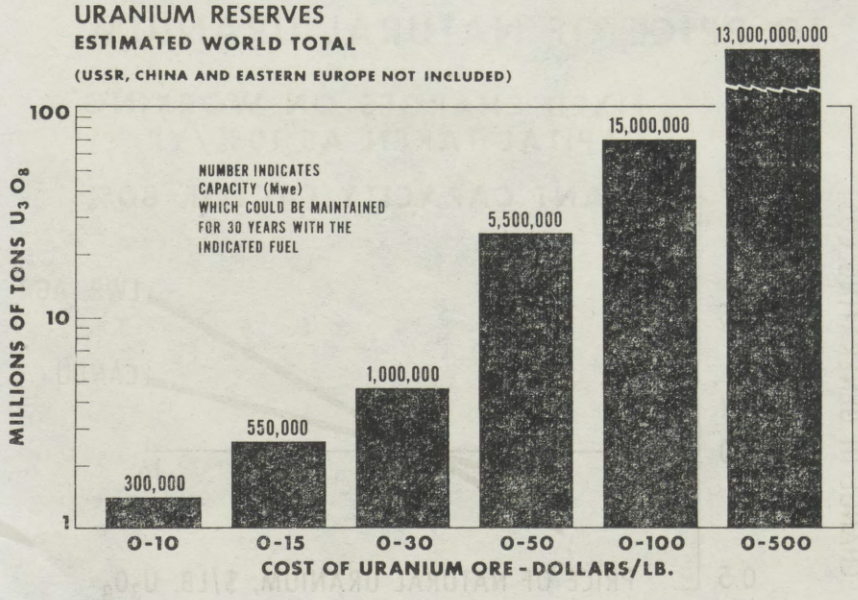


such an analysis for the current reactor types. As you can see, the chart shows the change in generating cost as a function of the price of natural uranium, assuming that any new fissionable material produced is recycled as future fuel and that the fixed charge rate on working capital is a sort of average value of 10 per cent. The sensitivity of the generating costs of light water and advanced gas cooled reactors—both of which are fueled with slightly enriched uranium—to increases or decreases in the price of natural uranium is obvious. While a short-term reduction in the price of natural uranium to say $5 per pound for U_3O_8 may reduce the operating cost of these reactors by $\frac{3}{10}$ths of a mill per kilowatt hour and that of the heavy water reactors by perhaps $\frac{1}{10}$th of a mill, the potential long-term increase in price will assert an economic penalty, particularly on the AGR and light water reactors. As you can see, if the price of natural uranium were to double, both the light water and advanced gas cooled reactors would effectively have their electric generation cost increased by $\frac{5}{10}$ths of a mill. The heavy water moderated and cooled reactor fueled with natural uranium is, from a neutron physics viewpoint, a more efficient machine. It utilizes one of the best neutron moderators known—heavy water—and as a result gets more energy out of a given quantity of fuel. In a sense, if one did no further development beyond the current types of reactors, the heavy water reactor would appear more and more competitive as the price of natural uranium increased. There are some advocates of this latter reactor type who because of this substantive point argue that further reactor development is really not essential for some time to come.

This fact focuses attention on the question of what degree of urgency must be given to this matter of increasing uranium prices. For, this should have a direct effect on the future planning and programs leading to the development of advanced and improved reactors. As an extreme—if the world could be assured that from here to the turn of the century the price for U_3O_8 would remain at today's level—there might be considerably less pressure and urgency for the development through government sponsorship of newer and more efficient reactors. Nonetheless there would remain some important incentives for the continued development of newer reactor types which might promise to be more economical than the current round of reactors. In the United Kingdom, this has been exemplified in the progress from the magnox reactors to the advanced gas cooled reactors.

To obtain some appreciation of the time scale which should be factored into these programmatic decisions the next figure (#10) shows the known and estimated uranium resources. I have shown these uranium resources as millions of tons of U_3O_8 as well as the related megawatts of nuclear generating capability. My figures are based on the assumption of sufficient fuel for a 30-year lifetime for

FIGURE 10



nuclear power plants of the current light water and advanced gas cooled reactor types. Combining the information presented on this chart with that on the earlier one (Figure #4) showing a very rapid exponential growth of nuclear power generating capability, one can predict tnat the known or estimated Worldwide or resources costing $10 per pound or less are sufficient to supply about 300,000 megawatts of nuclear generating capability, which will be contracted for, with the consequent commitment of the indicated amount of uranium, by 1980. If one considers uranium ore resources of $15 per pound or less, the reserves, both known and estimated, are sufficient for about 550,000 megawatts of nuclear power stations, a capacity which will be reached by about the year 1985. Using uranium ore resources of $30 per pound or less, the reserves are sufficient for about 1,000,000 megawatts of nuclear power, which will be reached by about the year 1990. A very important fact, shown by this present chart, is that there are enormous resources of uranium available if one is not limited by cost of the ore.

I might also add a word of warning about these figures. They do not reflect the increased activity during the past months toward new uranium exploration, in the United States, Canada and elsewhere. They represent the facts as we know them today. I am certain, however, that additional ore supplies will be found, in similar fashion to the new fossil fuel resources found yearly, and that this figure represents a conservative view of things.

In addition to these resources of uranium ore, vast quantities of thorium ore will be found—quantities similar in magnitude to that of the uranium ores. Thorium can also be considered a nuclear energy resource although it itself is not fissionable. Thorium–232, the isotope of thorium found in these ores, like the non-fissionable isotope uranium–238 which is the very abundant isotope of uranium found in nature, can be converted to useful fissionable form by nuclear transmutation. As you know, in the case of uranium–238 the small fraction of the naturally fissionable isotope uranium–235 provides the fission reaction neutrons which, when captured by uranium–238, cause it to undergo a transmutation eventually leading to plutonium–239—an isotope which is fissionable. Similarly, thorium–232 upon capturing a neutron can be transmuted to uranium–233, another fissionable isotope. Thus plutonium–239 and uranium–233 are the keys to unlocking the vast energies stored in uranium–238 and thorium–232.

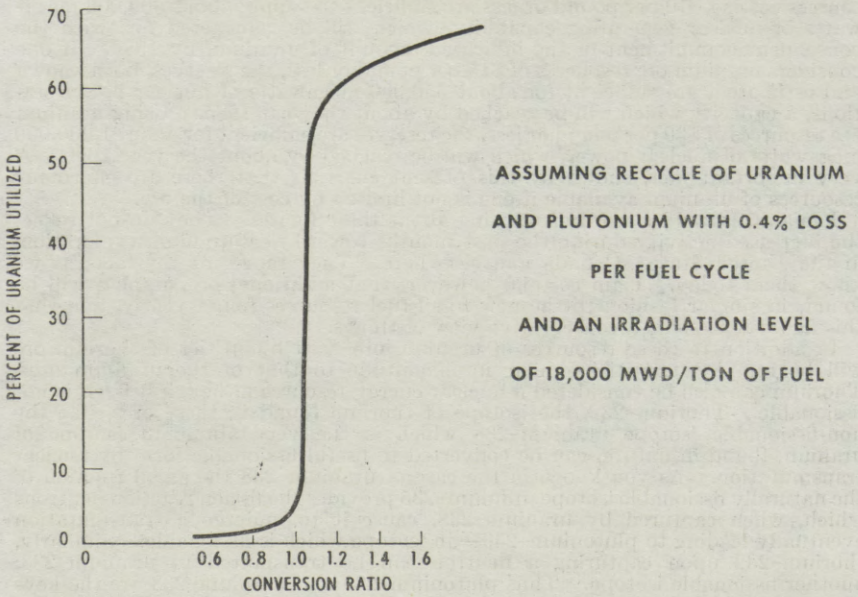
Unfortunately, the current reactor types do not take full advantage of this situation. In the case of the light water and advanced gas cooled reactors, for every atom of uranium–235 consumed only about 5/10ths or 6/10ths of an atom of plutonium–239 is produced (conversion ratio of 0.5 to 0.6). The heavy water moderated and cooled reactor is somewhat more efficient and, in this case, for every one atom of uranium–235, something of the order of 7/10ths to 8/10ths of an atom of plutonium–239 is produced (conversion ratio of 0.7 to 0.8). The data shown in the figure (#10) are based on the assumption that the megawatts of nuclear generating capacity capable of being supported by a given level of fuel resources are produced by the light water or AGR reactors, reactor types which have a lower efficiency than the CANDU reactors, or the advanced reactors which I shall describe, in utilizing the total energy contained in uranium.

We presently know that it is quite feasible to increase the efficiency of utilization of our uranium ore resources. The heavy water moderated and cooled reactor and certain advanced reactors which I shall discuss in a moment indicate one direction in which to proceed. Increasing the thermal efficiency of nuclear power plants is another direction. In general terms it appears readily possible to more than double the energy which can be extracted from a pound of urnaium by going to reactors with higher conversion ratios than the currently available light water and AGR reactors. I refer to the near breeders. The effect of this increased efficiency is reflected in the fact that with the installation of these near breeder reactors in place of the current reactors the period of use of the known uranium ore resources can be extended for about a decade. The actual effect of near breeder reactors is even more dramatic since some of these would utilize the thorium-uranium–233 fuel cycle to supplement and replace the uranium-plutonium–239 fuel cycle. But whatever fuel cycle is in fact used, near breeder reactors must provide improved nuclear efficiencies in order to make a significant contribution.

The next figure (#11) shows one way of utilizing the gains to be obtained by increasing the efficiency of the conversion or breeding ratio of the reactor. This curve assumes a 0.4% loss in each recycle of fuel and a burnup of 18,000 MWD/ton for each irradiation cycle. The recycle losses and burnups of course can vary considerably from reactor type to reactor type. You can see from this that the current reactor types with conversion ratios of 0.5 to 0.6 utilize only a few per cent

FIGURE 11

URANIUM UTILIZATION AS A FUNCTION OF CONVERSION RATIO



of the energy locked in the nuclear fuel, assuming recycle of all fissionable material produced in the reactor. This chart shows the obvious incentive for getting near or into a breeding regime. By breeding I mean—as many of you know—a reactor where more fissionable fuel is produced from the fertile uranium-238 or thorium-232 than is consumed in the fission chain reaction. This figure shows that if one gets to a conversion or breeding ratio of 1.1 or greater, tremendous gains can be obtained. Rather than utilizing only a few per cent of the energy present in the nuclear fuel, more than 50 per cent can be usefully harnessed. This fact also means that even though the current reactors inefficiently utilize the uranium and thorium fuels, these fuels are not wasted. The large fraction of uranium-238 and thorium-232 not consumed in these reactors can serve eventually as fuel for future breeder reactors.

This has an immediate compound effect. Assuming one is able to build economic breeder reactors, the nuclear generating capacity capable of being ultimately fueled with today's low cost ore resources is greatly increased. Second, the high efficiency of these reactors means that they should be less sensitive to increases in the future costs of nuclear fuel.

Unfortunately, as we all know, government life and service are not as simple as to permit one to say "let there be a breeder reactor and lo there is a breeder reactor." There are many real scientific and technological hurdles which must be crossed. In addition there are other types of advanced reactors—near breeders—which for the near-term have considerable economic promise. If one looks about the world today one can see several types of advanced reactors, including breeder reactors, under intensive development. The next figure (#12) shows the projected capital and generating costs of several types of near breeder and breeder reactors. As you can see in this illustration, I am paralleling the earlier figure in which I considered the current reactor types. I have broken these newer reactor concepts into three broad categories. The first one is characterized by the near breeder reactors, the High Temperature Gas Cooled Reactor (HTGCR) or the advanced gas cooled Dragon reactor, and the heavy water moderated organic cooled reactor (HWOCR) or the heavy water moderated, boiling light water cooled reactor (HWBLW) somewhat parallel to the steam generating heavy water reactor (SGHWR) here in the U.K., with conversion ratios of .8 to a little less than 1.0. The second and third categories represent two general categories of fast breeder reactors—low gain breeder reactors with a

FIGURE 12

NEAR BREEDER AND BREEDER REACTORS

PROJECTED CAPITAL AND OPERATING COSTS

1000 Mwe STATION

	NEAR BREEDERS	BREEDERS	
		LOW GAIN	HIGH GAIN
PROJECTED CAPITAL COST, $/KW			
PLANT	120	125	145
FUEL INVENTORY	30-10	45	25
HEAVY WATER INVENTORY	0-20	-	-
	150	170	170
PROJECTED OPERATING COST, MILLS/KWH			
FUEL (REFLECTING CREDIT FOR BRED FISSIONABLE MATERIAL)	0.7	0.5	0
OPERATION AND MAINTENANCE	0.3-0.4	0.3	0.3
	1.0-1.1	0.8	0.3

NOTE FUEL COSTS BASED ON $8/LB. U_3O_8 ,PU @ $10/FISSILE GRAM

NEAR BREEDER REACTORS INCLUDE - HTGR/DRAGON HWBLW/SGHWR/HWOCR

conversion or breeding ratio of 1.1 to 1.25 and a specific power of about 0.25 Mwe/kg of fissionable fuel, and high gain breeder reactors with a breeding ratio of 1.4 and a specific power of about 0.33 Mwe/kg. For these combinations of breeding ratio and specific power, the low gain breeder has a long doubling time and the high gain breeder a short doubling time. The low gain breeder can perhaps be characterized by the sodium-cooled, UO^2–PuO^2 fueled, fast reactor while the higher gain breeder reactor cannot now be as clearly characterized although it is surely more exotic.

Figure #12 reflects our conjectures today that the breeder reactors, representing a somewhat more difficult technology than the near breeder types, will be more expensive to construct. The near breeder reactor types, after all, are built on technology closer at hand. Further, you can see that the operating costs of the low-gain breeder and the near breeder reactors based on present uranium fuel prices are not too different.

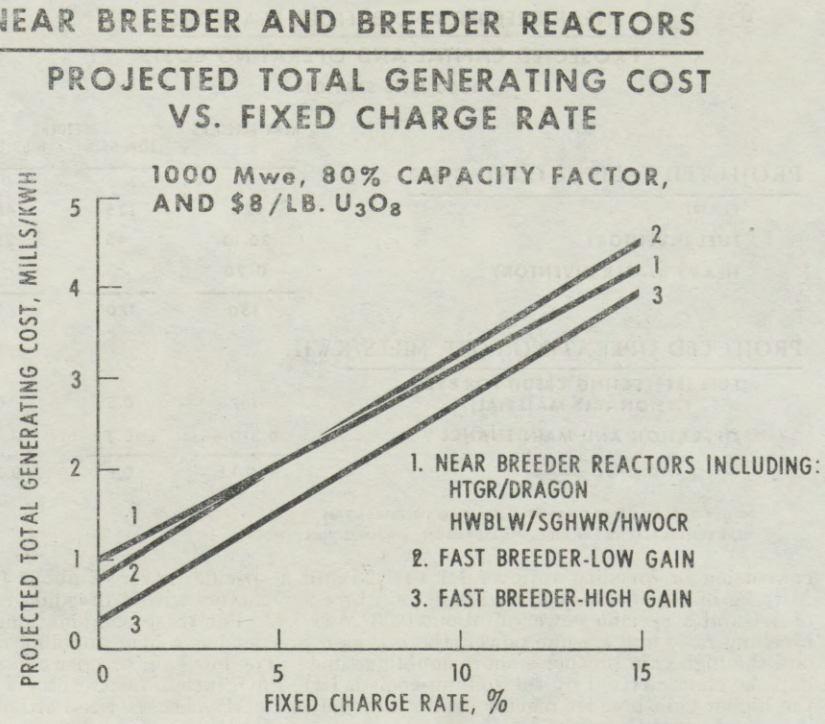
I should also add a word about two lesser known contenders in this reactor derby. For some years the Oak Ridge National Laboratory in the United States has been carrying on an extensive research and development program on a Molten Salt Reactor Project. This high temperature thermal breeder reactor utilizes thorium-uranium-233 in a homogenous fuel cycle. At present a 7500 thermal kilowatt reactor experiment is in successful operation. A high temperature thermal breeder reactor of this variety would not only be an efficient reactor with very low fuel cycle costs but would also require a smaller nuclear fuel inventory than a fast breeder reactor, further improving its economics. If all goes well with this Molten Salt Reactor Project it may have a profound effect on our future planning.

Another reactor under active development is the Seed and Blanket Reactor (the Light Water Breeder Reactor). This reactor program is aimed at the development of a thermal breeder reactor in the light water reactor system. The concept utilizes the thorium-uranium-233 fuel cycle and holds the promise common with other breeder reactors of extending our nuclear fuel resources significantly. It has the unique advantage that it is based on the well established light water reactor technology.

But this evening, for the sake of simplicity, let me focus attention on the better known near breeder reactors and breeder reactors.

If one takes the hypothetical figures for these reactors—and I stress that they are based largely on conjecture since we have yet to build or even firmly announce our plans to build a 1000 electrical megawatt unit of any of these types—and plots them against the variation in the fixed charge rate, one obtains the results indicated in the next figure (#13). At the present prices of uranium fuels, this chart indicates that these near breeder and breeder reactors, from a simple

FIGURE 13

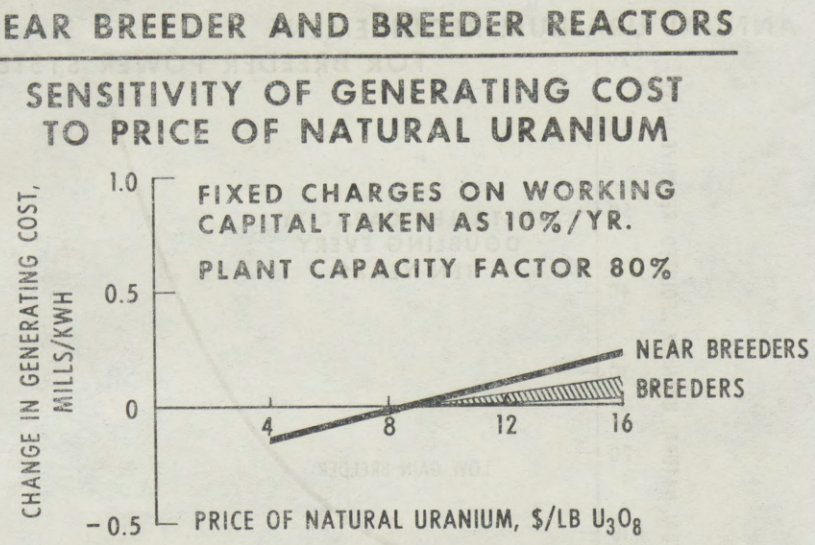


economic viewpoint, have considerable potential in those countries where the fixed charge rate is say less than 10 per cent. This is because they all promise to have remarkably low operating costs reflecting efficient fuel cycles. This also indicates that there is some incentive for developing these advanced reactors regardless of whether the price of uranium should increase—for they may be more economical than current types.

Of importance from a national and worldwide viewpoint is the built-in insurance policy which one can purchase with these near breeder reactors and breeder reactors. This insurance policy is reflected in the insensitivity of the total generating cost to the price of natural uranium as the next figure (#14) shows. You can see here that doubling the price of natural uranium increases the generating costs of the near breeder reactors about 2/10ths of a mill per kilowatt hour or less and that of the fast breeders perhaps 1/10th of a mill or even less. The fast breeder reactor, in fact, may prove so efficient that ore costing $100 per pound of U_3O_8 or more, available in virtually unlimited quantities, could still be used without a sizeable economic penalty. I should also observe that the curve for the near breeder reactors, while markedly different from that for the light water and advanced gas cooled reactors of the current round, is not too different from the heavy water moderated and heavy water cooled reactor. However, as you recall, the latter reactor type suffers from a high capital cost at this point in its development. Also a most important point is that near breeder reactors like the HTGR and Dragon and others would utilize the thorium-uranium-233 fuel cycle, thus increasing the reactor's conversion ratio since uranium-233 is the most favorable nuclear fuel from this respect in a thermal neutron reactor. As a result, the demands placed upon our ore resources would be less because of the increased efficiency of these reactors using the thorium-uranium-233 fuel cycle.

One other important consideration that must be borne in mind in analyzing the future trend of reactor development and its impact on nuclear fuel resources and the economy of electric power generation is the specific power of these future reactors. The specific power, that is, the power generated per kilogram of fuel placed in the reactor, can perhaps be viewed more simply in terms of the inventory

FIGURE 14



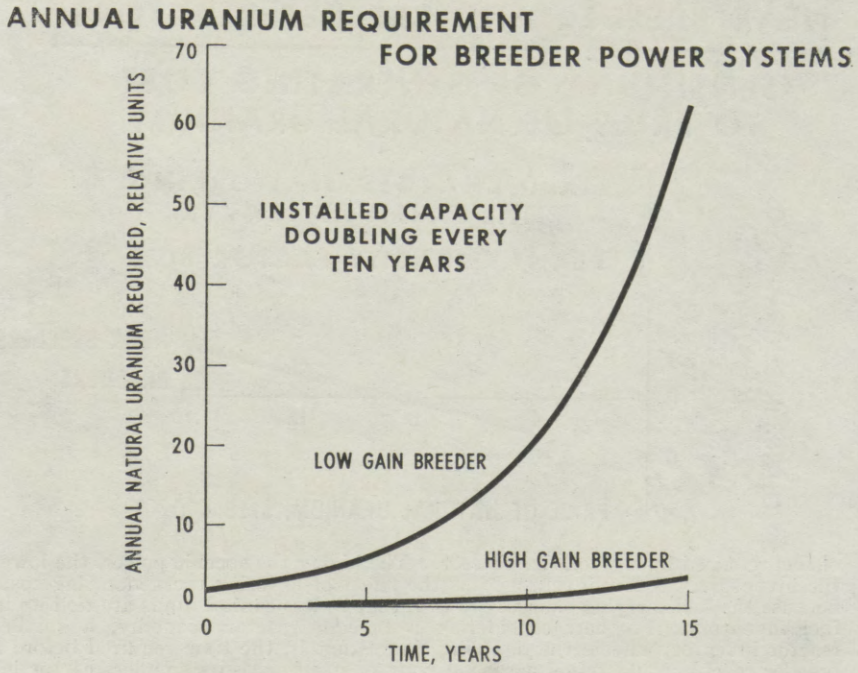
of fuel required by a given size reactor. The higher the specific power, the lower the inventory. A low inventory has the effect of lowering the generating costs because the fuel carrying charges are less; that is, less capital funds are tied up in fuel inventory. Further, considering a breeder reactor economy, a smaller reactor inventory affects the doubling time—that is, the time required before a breeder reactor could refuel a carbon copy of itself. Also a smaller reactor inventory in any type of nuclear plant means that the resource requirements are less. Therefore, there is considerable incentive to develop near breeders and breeder reactors with high specific power and therefore low fuel inventory requirements.

There is one further complexity that I feel should be considered even in this simplified treatment of nuclear power. It is, in a sense, a kinetic consideration. The growth of the annual electric consumption and that of nuclear electrical power will be rapid indeed for the next several decades. This poses a most interesting dilemma. If nuclear power is to satisfy these growing requirements to a larger and larger extent, great demands will be placed on our nuclear fuel resources even if a low-gain fast breeder reactor is developed. The reason here, in the most simplified fashion, is that if electrical requirements are doubling—say every ten years—and one has a fast breeder reactor which can produce new fuel at a doubling rate of 20 years—one would still have to continue to mine new uranium ores to make up the difference between that supplied by the breeder reactors and that required by the expanding power system. As time goes on, and as these requirements accrue in magnitude, it is conceivable that very expensive ores would have to be used.

This presents a possible continuing economic problem for some years in the future. But one could avoid this situation if it should prove possible to construct high-gain fast breeder reactors. I will not attempt this evening to give any specific qualities of this machine other than its breeding ratio of 1.4, its specific power of 0.33 Mwe/kg, and its doubling time, which would be less than ten years, perhaps seven years. A reactor with this short a doubling time, less than ten years, could meet the requirements placed upon the nuclear system by the growing electrical demand and seemingly always remain in a reasonably comfortable economic position.

My next figure (#15) attempts to illustrate this graphically in another manner. The doubling rate for electrical power demand in the world has, in fact, been about ten years and on this graph one can see the effects of a low-gain fast breeder reactor and those of a high-gain fast breeder in terms of the requirements placed on the uranium ore resources. In essence, a reactor economy dependent upon low-gain breeders requires ten to twenty times more ore than an economy based on high-gain breeders.

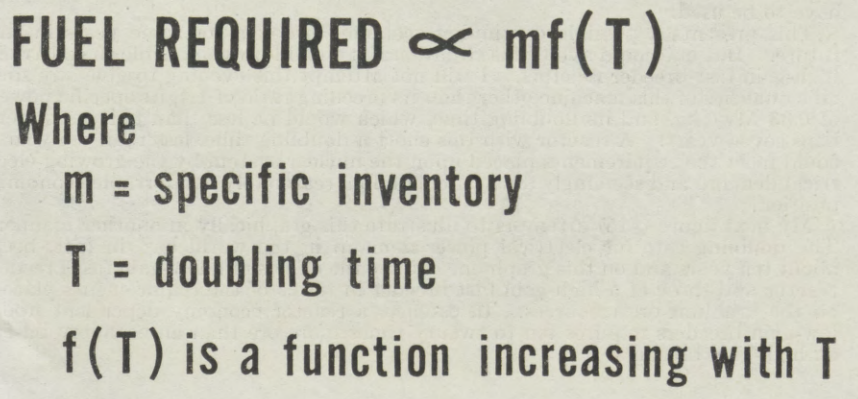
FIGURE 15



In summary then, for a breeder reactor to catch up with and maintain a prescribed total power growth rate, it is necessary that the doubling time of the breeder reactor be, or eventually become, as short as that of the power growth. It is interesting to note, as shown in the next figure (#16) that, in more quantitative terms, the amount of fuel that must be supplied to the breeder system to accomplish this mission is proportional to mf(T) where m is the specific inventory of nuclear fuel (reciprocal of the specific power), T is the breeder doubling time, and f is a function increasing with T whose form depends upon the power growth curve.

To give one further glimpse into the economic complexity of this situation before I conclude, consider what might happen in the oversimplified case where the demand for electric power slowed down appreciably and one had an entire economy of reactors of the high-gain breeder type. At this point there would

FIGURE 16



be a plethora of fissionable material with insufficient consumers for power uses. On a free market basis, the bottom would drop out of the market and the price of fissionable material—either plutonium–239 or uranium–233—would sink very low. At this point, there would obviously be an economic incentive to build reactors to simply burn and thereby consume this excess material without producing new fissionable material. This assumes that these burner reactors could be simpler reactors than the breeder variety and therefore constructed at somewhat less cost. Interestingly enough, the current generation of reactors could be considered to be just such burner reactors as could some of the advanced types. What I mean to imply by this is that any future reactor economy will probably be a mixed reactor economy. We will probably always have several types of reactors, with new reactor construction determined, among other factors, by the projected rate of growth of electric power demands, the price of natural uranium, and the price of bred fissionable material at the time the decision to go ahead with a reactor unit is made.

In closing, let me return to a point I illustrated just a moment ago, the plethora of fissionable material. Whether or not near breeder reactors and breeder reactors are, in fact, developed, built and operated, significant amounts of fissionable materials, especially plutonium, will be bred throughout the world. And, as you know, plutonium can be used as the explosive ingredient of nuclear weapons. The last figure (#17) summarizes the cumulative quantities of plutonium

FIGURE 17

CUMULATIVE PLUTONIUM PRODUCED WORLD-WIDE

YEAR	TOTAL KGS/OF PLUTONIUM
1970	10,000
1980	180,000
2000	4,000,000

that would be produced by the year 1980 and the year 2000. Astonishing amounts indeed. This plutonium will be produced throughout the world by 1980—if our projections are correct—at the rate of more than 100 kilgorams a day! In other words, material will be produced over the face of the globe sufficient for the potential production of a substantial amount of the world's electrical power—or, alternatively, sufficient for tens of nuclear weapons a day.

In the light of this, there are some who would say that the only rational course is to bring an abrupt and complete halt to the development of nuclear power here and now; that the price we pay for a little additional energy is much too high for the risk of nuclear annihilation, and that no adequate means of control can be developed to insure, in fact, that these nuclear fuels will not be misused.

But most of us know that such thinking is not fully realistic. Even in the early days of nuclear development, while there were some who felt we could hold back all our information and discoveries on this new form of energy, thus keeping others from obtaining nuclear weapons, most of us knew that it was only a matter of time before other countries could achieve a nuclear capability independently of the United States, the USSR, and the United Kingdom. The major secret of the atomic bomb was, of course, that it worked—and this had been revealed to the world. Many countries of the world had their own supplies of natural uranium and, perhaps more importantly, their own scientists. We

also considered that if we failed to cooperate in sharing our peaceful nuclear technology and nuclear materials, there would be other countries which might be willing to provide nuclear materials and technology without a firm assurance as to their eventual peaceful end use.

Choosing, therefore, a more positive and constructive approach, the task has thus become not a matter of forbidding the further spread of nuclear science, but rather one of helping one another to develop the peaceful uses of nuclear energy under conditions which assure the peaceful use of the nuclear equipment and materials which are supplied.

An organization already playing a very significant role in guaranteeing that the peaceful atom will remain peaceful throughout the world is an agency whose existence is hardly known to the general public. This organization is the International Atomic Energy Agency (IAEA) with its headquarters in Vienna and its current membership of 96 nations, with three additional member nations about to be admitted. We have in the work of the International Atomic Energy Agency perhaps the forerunner of a fully international safeguards and control system. The essence of this system lies in the right to inspect facilities and materials supplied through international agreement. Such inspections are carried out by IAEA international inspection teams at those facilities whose countries have agreed to put them under international safeguards. Unfortunately, not all member countries of the IAEA have placed their facilities under such inspection arrangements yet. I am pleased to say that the United Kingdom has placed one of its large power reactor stations under IAEA safeguards inspection, as has the United States.

In addition to its present activities relating to the inspection of reactors, the IAEA has recently considered and developed appropriate safeguards and controls for chemical reprocessing plants to assure that none of the materials separated and purified in these plants are diverted to non-peaceful uses.

I am hopeful that the future will show a continued increase in the application of these IAEA safeguards and controls and that eventually we may have a world-wide system of safeguards and controls under which all nations will be able to develop and share the peaceful atom free from the fear of a potential nuclear threat.

In conclusion—and I regret that I do not have an appropriate chart or graph to illustrate this point—it has been a great pleasure for me to come to London to address the British Nuclear Energy Society. The fact that your country leads the world in the use of nuclear power to generate electricity, I believe, speaks well for the effectiveness of your Society in bringing Great Britain the remarkable advantages of the peaceful atom. Your highly successful nuclear programs devoted to peaceful endeavors should serve as an inspiration to many countries. We in the United States are proud to have been your partner in the development of nuclear energy since its earliest days. We look forward to a continued and growing era of cooperation with you as together we seek to further develop and make available to all men those benefits of nuclear energy which will promote peace and progress throughout the world.

Appendix 12

Remarks by Commissioner John G. Palfrey, USAEC, at the European Nuclear Science Center Program, Atoomforum Conference, the Netherlands, March 2, 1966

Competition and the Peaceful Atom

The suggested topic for my remarks today was atomic energy in the United States, which certainly gives me leeway, if not guidance. An additional source of instruction is what other Commissioners have said at other atomic forums in Europe on previous occasions. The trouble with that guidance is that one only learns what the Commissioners thought Europe wanted to hear, not necessarily what they did. One looks further at the impressive schedule of speakers and subjects during the conference to follow and everything is covered. So this leaves me free to say what occurs to me.

What occurs to me is to look briefly at the contemporary United States and international nuclear power scene and in the process to identify certaln competitive forces at work and to see in what direction they are leading us.

Before this audience in these introductory remarks, I would like to concentrate on the operational effects of three of these areas of competition—competition

among the United States suppliers of the proven light water reactors, competition between nuclear and fossil fuels, and competition between the various reactor supplier countries.

Discussion of competition among the domestic reactor manufacturers gives me a chance to bring you up-to-date on the current U.S. picture.

Dr. Tape, five months ago at the second Foratom Congress in Frankfurt, noted that current utility interest was focused on central station nuclear power plants of about 500 to 700 electric megawatts in size, and that such plants were being sold in economic competition with conventionally fueled plants in the U.S. In the five succeeding months, nuclear power plants have continued to compete. January of this year was referred to by *Nucleonics Week*, our leading trade publication, as "the most dramatic month the brief history of nuclear power has yet seen." The basis for this statement lies in the fact that five large nuclear power plants were sold in the U.S. in that month (four in the 700–800 MWE range, I might note—indicating that Dr. Tape's figures are already a bit out of date). These reactors will have a total capacity of 3,480 electrical megawatts—these figures compare with eight nuclear power units privately purchased in all of 1965, with a total capacity of 4,800 megawatts electric. I do not suppose the January pace will be maintained but it is an impressive demonstration of momentum.

The figures on these plants are impressive as to costs and as to reliability—22¢ per million BTU and expectations to exceed the 80–90% availability of the current generation of nuclear plants, taking into account the periods needed for refueling.

Who should get the credit for all of this? What brought the cost of nuclear power down from 50 mills at Shippingport in the mid '50s to 4 mills in the mid '60s? To answer this is a highly speculative and uncertain undertaking. No doubt the story in England or in Canada, for example, might be quite different. Almost everyone would agree that there were no one or two large breakthroughs that accounted for it.

In the U.S. I would say the process of reducing nuclear power cost would not have happened so rapidly, if the Joint Committee on Atomic Energy and Congress hadn't laid the foundation by authorizing private ownership and operations in the Act of 1954; if the Shippingport reactor hadn't been built, expensive though it was; if there hadn't been cooperative demonstration power programs between government and industry; if there hadn't been suppliers and utilities prepared to construct and operate the pioneer commercial reactors like Dresden I in Illinois and Yankee in Rowe, Massachusetts.

The Commission's theory has always been that if it took the lead in developing and demonstrating the technology at first, economic factors would then work to accelerate industrial applications and lead to a self-sustaining and growing nuclear industry.

In its 1962 Report to the President, the Commission concluded that the light water reactors then planned for construction would bring nuclear power to the threshold of economic competitiveness in the higher cost power areas of the United States, and that relatively modest assistance by the AEC would assure the crossing of that threshold. Subsequent evidence has amply supported that estimate. The competitive processes of private industry finally have taken hold with the dramatic results we have seen. So the last and decisive factor in bringing down the costs in the United States was the process of competition between the manufacturers.

Now, the government's concern in the domestic field of proven reactors is first that the industry is effectively regulated to assure the public health and safety, but not regulated to death, and second that the base of competition does not become too narrow.

One generalizes about the U.S. anti-trust philosophy at one's peril, but I think it is safe to say we would prefer to have five or six companies rather than two companies competing in a filed of industry assuming there is enough business to keep those companies alive and healthy.

A second area of competition was an inevitable consequence of the first. The accelerated reduction in the cost of nuclear power and its increasing competitiveness with fossil fuel plants brought about an accelerated concern on the part of the coal industry.

Authoritative estimates on the percentage of all electricity in the United States to be produced from nuclear sources by 1980 vary widely—from about 10% to almost 20% (I have heard 30% given for Euratom)—any of these figures are large enough to be a matter of concern to competing industries. This is a natural

concern, but I believe that there are two answers to it in the United States—and I suspect that the same conditions prevail in your case. The first answer focuses on estimates of the increase in the use of power by 1980: Since we will probably be using on the order of 2½ times as much power, even though coal loses in terms of the percentage it supplies, it must gain tremendously in terms of the actual amounts of power supplied. In short, there will be plenty of markets for all. This condition exists not just for the relatively short range future—energy use is expected to at least double again between 1980 and 2000.

A principal question remains whether, despite these estimates, nuclear energy will in fact enter the field so abruptly as to cause a sharp dislocation in the market.

My own personal view is that recent demonstrations of confidence that the reactors being built today in some areas of the United States for operation in the 1968–1970 period will be fully competitive, or more, with fossil fuel plants, will compel most utilities, particularly in the high cost power areas, to sit up and take notice of the nuclear power alternative. It does not mean that all of them will decide overnight to buy nuclear plants from now on.

There are many variables to be considered—for instance, the question of reactor siting. One of the principal jobs before the Commission in the next decade is that of establishing sound criteria for the location of proven reactors in more populated areas. Because of the correct insistence of the AEC on the paramount importance of reactor safety, the licensing process for nuclear reactors is a comprehensive and often an extended process under present procedures, and probably will remain so, even under the recently proposed streamlining of these procedures.

I do not think anyone can predict with confidence the effect of these elaborate requirements, the siting questions, the public reaction to nuclear power, inertia and the familiarity with conventional fuels upon the processes of decision of utilities. My own guess is that the AEC's judgment that there will be no sudden dislocation of the conventional industry will be confirmed.

I think the Commission's job in the area of proven reactors is one of concentrating on the sound regulation of reactor location and reactor safety through the licensing process. It no longer needs to support and promote the proven reactors. Most importantly, as I have said before, on other occasions, I think the interests of no one would be served if fossil fuels and atomic energy were to go at each other's throats—one crying pollution of the air, the other the risk of atomic catastrophe. Each has plenty to do and plenty to contribute to the growing demand for electrical power without trying to hold the other back or to occupy the field by means of a public relations war.

However, cut throat or otherwise, competition to date has benefited the consumer. In the past five years atomic energy has been pursuing a moving target as coal production techniques and railroad transportation have risen to the challenge of nuclear power. Costs of fuel have dropped significantly during this period of increasing competition.

I suppose the Netherlands may experience a comparable period of competition sometime in the future between natural gas and atomic energy.

The third level of competition is not between suppliers or between fuels but between countries. Here I don't think the desirability of competitive incentives and self-regulatory effects of nations competing for a world market, particularly a world nuclear market, is as clear. It is also less clear by what laws the competitive process is kept within healthy bounds.

While most of what I have to say hereafter is concerned with the negative potential of international competition, and the positive potential of international cooperation in the nuclear field, I think we ought to begin by giving international competition its proper credit. For example, competition must be recognized as one of the moving forces in the United States behind the Act of 1954, which not only opened up the field to United States private industry but also opened up the possibility of agreements for cooperation with other countries and the whole atoms for peace programs.

Two things were clear to the United States by 1954. First was that the United States was not going to prevent other countries from building nuclear reactors simply by withholding our cooperation—rather, other countries who were building reactors were going to create and control a new market unless the United States made greater headway. Second was that there was a significant opportunity for cooperation in the civil uses field and along with it an opportunity to prevent civil uses cooperation from being diverted to military purposes by safeguarded agreements. Competition therefore was one component—but only one—in a bundle of considerations in 1954. Since then, one hesitates to say what has motivated countries like the UK, France and Canada in their reactor development programs.

Certainly one element is sensible long-range planning to meet their own energy needs. Another is the lively developing competitive market for nuclear power reactors. Today one frequently sees competing bids from two or three supplier countries.

On this subject of bids, I would like to point out one somewhat asymmetrical aspect of the United States position. If the Netherlands, for example, were asking for bids from UK, Canada or the U.S. on a reactor, from the U.S. it would be getting bids from GE, Westinghouse, Babcock and Wilcox, etc., while from the UK and Canada it would be getting bids from the atomic energy authorities. This doesn't mean the USAEC is disinterested. It spent two decades building experimental reactors and prototytpes and much research and development money on light water reactors. It has gone to great efforts to assure long-range fuel supplies for enriched uranium reactors, and soon to provide for toll enrichment services, etc. The government plays a further role in the negotiation of agreements involving the sale of reactors abroad. Nevertheless, the present role of the United States Government is to regulate light water reactors, not to promote them or sell them abroad. The United States Government is not the salesman, the private companies are the salesmen.

In operation to date, I don't believe it has made much difference, but I can imagine competitive situations where the differing roles of the governments of the supplier countries could influence the outcome of the competition.

Overall, I think it is fair to say that the Netherlands will find nuclear energy competing with gas more effectively and more quickly because of the competition between the reactor supplier nations.

Having given economic competition among nations in nuclear power its credit and its due, I now turn to three dangers of unbridled international competition which far exceed in importance the winning of a competition for the sale of a reactor on the world market.

The first of these potential dangers is cutting corners on reactor safety for the sake of the sale. I find this danger remote but still necessary to identify lest we forget. I am confident this won't be done by any nation, if only from a sense of responsibility on the international as well as the national scene.

I am encouraged in my hope that the increasing international competition in the supplying of nuclear power reactors will not overshadow the primary concern of all countries for the safety of these reactors, by last month's meetings between our regulatory staff and their English and French counterparts. I understand a similar meeting with Canada is planned for this month. I hope future plans will include other countries. These meetings are designed for the exchange of detailed information about each other's regulatory and safety surveillance philosophies and procedures, to learn what programs and practices have been useful, and which unsatisfactory, and to exchange technical information on certain important topics relating to safety. A long-range aim of these meetings is to see whether it is practical to develop internationally applicable safety standards and procedures. Even on the purely commercial level, it is important for the tradition of international peaceful nuclear cooperation to set resasonable limits to international competition, because a serious nuclear accident anywhere in the world would seriously delay the acceptance of nuclear reactors everywhere.

A second potential threat of international competition in nuclear reactors is that it may operate overtime to curtail the impressive record of international cooperation, bilateral and multilateral, that has characterized the development of atomic energy for peaceful purposes. The United States regards these cooperative programs of immense importance. Euratom itself is a symbol and fact and promise of cooperative development of atomic energy. The United States has always attached, and continues today to attach, a very high importance to its cooperative undertakings with Euratom, such as the successful U.S.-Euratom fast reactor exchange program and the projected information exchange in the heavy water organic cooled reactor program, which is currently under discussion in Washington.

Similarly, in dealings with individual countries there is a long history of cooperation in the civil uses of atomic energy, which has demonstrated a sturdiness and continuity quite independent of periods of stress in other areas. As you know, we have an agreement for cooperation with the Netherlands for research and power which we hope will be extended further next year. In our bilateral agreements with the supplier countries, I hope the fact that the UK or Canada, for example, may beat out a U.S. company, on more than one occasion, in selling reactors, will not alter their long term cooperation and exchange programs. There will always be plenty of long-range programs still in the developmental stages where cooperation and exchange of information is sensible and mutually beneficial.

The third and final risk of unrestrained international competition in the civilian nuclear power field is that countries may be tempted to lower the amount of inspection and safeguards they require over the materials and equipment involved in the reactor they are trying to sell.

Most of you are familiar with the question of safeguards and their contribution to the goal of keeping the peaceful atom peaceful, by inspections to protect against diversion of the material for military purposes.

There are bilateral safeguards imposed by the supplier countries and there are multilateral safeguards such as those of Euratom and those of the IAEA.

Euratom, formed in 1957, has broad rights of ownership and control over all fissionable material in the Community. The United States strongly supported this development at the time it took place, and, in recognition of the vitality, high technical standards, and international character of the Euratom control system, we have provided in our agreements with Euratom for the exercise of controls on United States supplied materials by Euratom rather than by ourselves. As our individual agreements with the member states expire—a process which began last year with the expiration of our bilateral agreement with Belgium—the transfer to Euratom of safeguards responsibility for United States supplied material will be completed.

Important as these safeguards have been, we have regarded both the bilateral arrangements and, even a regional system such as Euratom, as only interim ways of meeting the basic problem. We have believed from the start that the long term solution must be to develop a single comprehensive and effective international safeguards system administered by an international organization of broad membership receiving the support of the whole world through acceptance of its application.

We have had several reasons for consistently sticking to this position. To begin with, safeguards administered by an intrenational organization should offer more credible assurances to the world at large that the projects being assisted by the United States are in pursuit of peaceful objectives only. In some countries an assurance based on American inspection alone may not be convincing.

Of even greater importance is the recognition that many nations besides the United States now provide nuclear assistance to other countries. Accordingly if we relied simply on a system of bilaterally applied safeguards in this developing situation, we would find that some nations might apply effective controls while others would apply wholly inadequate controls or no controls at all. Because of the competitive commercial pressures that exist in the international nuclear power market, the ultimate result would probably be a reduction to the lowest common denominator—no safeguards at all.

A system administered by an international agency encourages the uniform application of a technically adequate series of controls to all significant transactions. It also offers the promise of removing the matter of safeguards from the marketplace.

To meet this need, the International Atomic Energy Agency, with strong U.S. support, has been developing over the last several years its own capability to apply safeguards to nuclear activities. A simplified system which promises to be effective for verifying the peaceful use of both large and small nuclear reactor facilities recently has been reviewed by the Agency's Board of Governors. The Agency's system applies automatically to nuclear projects which have been assisted by or through the Agency, and it applies to any other project where the member states concerned request the Agency to apply its safeguards. Therefore, one of our major tasks has been to convince all important suppliers of nuclear assistance that they should insist on the application of safeguards, preferably IAEA safeguards, as a condition of making their help available to other countries.

Fortunately we have found common agreement with this objective. Other countries, notably the United Kingdom and Canada, have followed the policy of requiring safeguards on their nuclear energy assistance. Like ourselves, they prefer international safeguards, but they have relied on bilateral safeguards until IAEA could fully develop its own system and capability.

For its part, the United States is now pursuing a determined policy of replacing its bilateral safeguards with the safeguards of the IAEA. Whenever our agreements for cooperation are extended or amended, we have undertaken to secure agreement that the parties shall promptly request the IAEA to apply its safeguards to the agreement. We have been remarkably successful in this effort, and some 20 countries receiving our materials or equipment (either directly or through the IAEA) have agreed to submit these arrangements to IAEA safeguards.

Perhaps most important of all, during the later phases of the formulation of the IAEA safeguards system, there has developed unanimous support by the Agency's 25-member Board of Governors for the system—support from East and West, nuclear powers and non-nuclear powers alike. In particular, the Soviet Union has come to support the system and has participated constructively in the debates which led to its development. I believe that this broad support is due to a widespread realization of the dangers of nuclear proliferation and of the necessity to develop practical measures to prevent it.

Finally, we have reason to hope that negotiations for a non-proliferation treaty will be successful in Geneva and that along with it will be an undertaking by the non-nuclear weapons countries to accept IAEA or equivalent safeguards on their civil nuclear programs.

But with a treaty or without it, all countries supplying nuclear material and equipment to anyone else, like it or not, have inherited a major responsibility to make certain that no consideration of economic competition—of making a sale—will interfere with their determination to keep the peaceful atom peaceful, through the safeguards they impose.

Appendix 13

AEC Letter Concerning IAEA Study of Power Requirements in Luzon, the Philippines

U.S. Atomic Energy Commission,
Washington, D.C., June 29, 1966.

Mr. John T. Conway,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States, Washington, D.C.

Dear Mr. Conway: The International Atomic Energy Agency has recently completed a study in the Philippines entitled "Pre-investment Study on Power, Including Nuclear Power, in Luzon". The purpose of the study, which was financed jointly by the UN Special Fund ($477,000) and the Philippine Government ($230,000), was to examine the relative economics of the various ways of meeting the growing demand for power of the Luzon Grid during 1966–75. The study was initiated in early 1964 and is divided into two parts. Phase A deals with an evaluation of conventional energy resources and an estimation of load demand, while Phase B deals with the preparation of the most suitable power development program through 1975, including conventional thermal, hydro and nuclear power stations. The Project Managers for Phases A and B were Mr. Hollis Sels, retired U.S. utilities executive and Dr. J. A. Lane, ORNL, respectively.

The results of the study clearly indicate that indigenous energy resources in the Philippines are unable to meet the projected power requirements in Luzon during the next 10 years. On the basis of the comprehensive market survey which was carried out, it appears that during 1966–75 there will be an average annual growth rate of 12.7% and that 2,700 MWE net installed capacity will be needed in Luzon by 1975. The extensive investigation of Philippine hydro, coal, oil, gas and geothermal energy resources, on the other hand, revealed that even under favorable conditions such resources could supply only 550 MWE or about 20% of the required capacity. Taking into account existing plants and commitments already made for new conventional oil-fired plants to come into operation by 1970, there is left a gap of about 1000 MWE which must be made up by conventional oil-fired stations or by nuclear power, depending on which is most desirable for the Luzon Grid.

A number of conditions exist which indicate that nuclear power may be the most desirable. These include: (1) The present cost of fuel oil is 41 cents per million BTU and, as the analysis shows, this is not likely to change in real terms over the foreseeable future. (2) The Luzon Grid demand will continue to grow at a fairly rapid rate, and the system can absorb units of 300 MWE size at high load factors. A nuclear plant of this size (a light water reactor such as could be supplied by GE or Westinghouse), when providing base load, appears to be competitive with imported oil at about 33 cents per million BTU. This is based on private utility financing with fixed charges of 16% and a plant factor of 80%.

Thus, in Luzon there is an economic margin in favor of the nuclear plant. (3) The system planning studies show that a nuclear plant could be in operation by 1971 if decided upon by the end of 1966, that 1000 MWE could be entirely base loaded, and that the optimum size of plants would be 3 nuclear plants (300, 300 and 400 MWE) or 4 conventional oil-fired plants (250 MWE). The initial investment costs of these plants would be $182 million for the 3 nuclear plants or $147 million for the 4 conventional plants, but the difference would be offset by fuel cost savings by 1978. (4) The Manila Electric Company (which assisted with the study) is extremely well managed, is in a good position to undertake a nuclear power program, and is enthusiastic about doing so, as is the Philippine Government.

The IAEA's study has been submitted to the Special Fund and the Philippine Government and probably will be released in the near future. Its basic recommendation is that as soon as the financing can be arranged, bids should be invited on both a 300 MWE nuclear plant and a 250 MWE oil-fired plant in order to confirm the estimates of the study. Upon confirmation of these estimates, the nuclear plant program should be started, but nuclear and conventional costs could be compared prior to commitment to each new plant.

The IAEA feels that the study has made a significant contribution to the Philippines by changing their attitude toward nuclear power and by raising their level of competence in power planning and project evaluation. Philippine engineers were trained under IAEA fellowships and participated in the study. In addition, the IAEA foresees that other countries undertaking a study in this field will be able to benefit from the method of analysis used in the Philippine study

It appears to us that this has been one of the Agency's most worthwhile undertakings in the nuclear power field.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

APPENDIX 14

AEC STATUS REPORT ON "SISTER LABORATORY" ARRANGEMENTS

U.S. ATOMIC ENERGY COMMISSION,
Washington, D.C., April 11, 1966.

Mr. JOHN T. CONWAY,
Executive Director, Joint Committee on Atomic Energy,
Congress of the United States.

DEAR MR. CONWAY: The purpose of this letter is to inform the Joint Committee on the status of Commission sister laboratory arrangements with selected nuclear centers in developing nations.

The first such arrangement, entered into in 1962 between Turkey's Cekmece Nuclear Center and the Brookhaven National Laboratory, expires June 30, 1966. The Turkish AEC has informally expressed an interest in continuing this arrangement, for an additional three-year period, with Turkish funds. The BNL has advised us that they are prepared to proceed on this basis and, accordingly, we expect that this arrangement will continue for at least another year. The cooperation with the Greek Democritus Nuclear Center, also through BNL, is supported on a year-to-year basis by the Commission as an adjunct to the Turkish arrangement.

The Oak Ridge National Laboratory cooperative program with Thailand is authorized until June 30, 1967. Consideration is being given to the possibility of including the Viet-Namese reactor center at Dalat as a corollary to the ORNL-Thai cooperation.

The arrangement between the South Korean Atomic Energy Institute and the Argonne National Laboratory is expected to continue through FY 1967. ANL's projected assistance to Taiwan's nuclear research program will be funded by the Government of China over approximately the same period.

The Puerto Rico Nuclear Center-Colombian Institute of Nuclear Affairs cooperative arrangement was approved in September 1965 and is expected to continue at least through June 30, 1967. The PRNC also began supporting the Venezuelan nuclear research program in February 1966, as an adjunct to

the cooperation with Colombia. In addition to technical assistance to both research reactors, PRNC will attempt to draw these research programs into cooperation with each other.

As you know, these assistance programs involve comparatively modest costs, primarily for the travel of American experts and minor items of equipment not otherwise obtainable. Taiwan's agreement this year to pay some $20,000 for ANL assistance is a new development, and we anticipate more of this sort of self-help.

We have provided greater detail on some of these arrangements to the Committee in the past, and would be pleased to provide any further information which the Committee may believe to be of value. We will, of course, continue to keep the Joint Committee informed on the progress of this program.

Sincerely yours,

JOHN A. HALL,
Assistant General Manager for International Activities.

Appendix 15

Foreign Reactors Operating, Being Built, or Planned, as of March 1, 1966 [1]

World reactors—Other than the United States

Country and designation	Type	Site	Output	Criticality
Afghanistan				
Being built: ——	Research (Soviet)	Kabul		1966.
Argentina				
Operating: RA-1	Argonaut	Buenos Aires	30 KWt	1958.
Being built: RAEP-1 (RA-3)	do	Ezezia Center	1–5 MWt	Late 1966.
Planned: ——	Power	Near Buenos Aires	300–500 MWe	
Australia				
Operating:				
HIFAR	UTR-10	Lucas Heights, Sidney	11 MWt	1956.
MOATA	Argonaut	do	10 KWt	1961.
Planned: HTGR				
Austria				
Operating:				
ASTRA	Pool	Siebersdorf	5 MWt	1960.
Prater Triga	Triga Mk-II	Prater Park, Vienna	250 KWt	1962.
SAR-3	Argonaut	University of Graz	1 KWt	1965.
Planned: ——	Power		5–20 MWt	
Belgium				
Operating:				
BR-1	Natural uranium graphite	Mol	4–10 MWt	1956.
BR-2	Tank	do	50 MWt	1961.
BR-02	Pool	do	100 KWt	1960.
BR-3	Prototype pressurized water	do	10.5 MWe	1962.
RR-BN-1	Pool	University of Ghent, Ghent	15–100 KWt	1963.
Planned:				
Vulcain	Spectral shift	University of Liege	30–50 MWt	1967.
——	Power	Near Huy and Liege	600 MWe	
——	do	Near Antwerp	600 MWe	1971.
Brazil				
Operating:				
IEAR-1	Pool	São Paulo (Institute of Atomic Energy)	5 MWt	1957.

UMG	Triga Mk–I	University of Minas Gerais, Belo Horizonte	100 KWt	1960.
ARGONAUTA	Argonaut	University of Brazil, Rio de Janeiro	10 KWt	1965.
Planned:				
——	Power	South-central region near Guanabara	300 MWe	1969.
——	do	Southern region near Tapes, Rio Grande do Sul.	60 MWe	1970.
——	do	Northern region	50 MWe	
CANADA				
Operating:				
McMaster	Pool, 90 percent enriched uranium	Hamilton, Ontario	1 MWt	1959.
PTR	Enriched uranium	Chalk River, Ontario	10 KWt	1957.
ZED–II	Natural uranium, heavy water, moderated	do	100 W	1960.
ZEEP–1	do	do	10 W	1945.
NPD	Power, natural uranium, heavy water-moderated.	Rolphton, Ontario	22 MWe	1962.
NRU	do	Chalk River, Ontario	200 MWt	1957.
NRX	do	do	40 MWt	1947.
WR–1	Power, organic cooled, heavy water	Whiteshell Nuclear Research Center, Manitoba.	40 MWt	1965.
Being built:				
CANDU	Power, natural uranium, heavy water	Douglas Point	200 MWe	1966.
Pickering Station	do	Near Toronto	1-000 MWe	1970–71.
Planned: ——	Power, boiling light water	Near Quebec	250 NWe	1971.
REPUBLIC OF CHINA				
Operating: Thor	Pool, light water, enriched uranium	Tsing Hua University, Hsin-Chu, Taiwan	1 MWt	1961.
Planned: ——	Power		300 MWe	1971–72.
COLOMBIA				
Operating: ——	Modified Argonaut	Near Bogotá	10 KWt	1965.
CONGO (LÉOPOLDVILLE)				
Operating: Trico	Triga Mk–II	Lovanium University, Léopoldville	50 KWt	1959.
DENMARK				
Operating:				
DR–1	Homogeneous boiling water	Risø	2 KWt	1957.
DR–2	Tank, 90 percent enriched uranium	do	5 MWt	1958.
DR–3	Pluto, 90 percent enriched uranium	do	10 MWt	1959.
FINLAND				
Operating: FIR–1	Triga Mk–II	Helsinki (Otaneimi)	100 KWt	1962.
Planned:				
——	Power	Ahlainen (west coast)	300 MWe	1972–73.
——	do	Kotka (south coast)	300–350 MWe	

[1] Information herein furnished by the Division of International Affairs, U.S. Atomic Energy Commission.

World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
FRANCE				
Operating:				
Alize' II	Pool	Saclay	0	1961.
Aquilon	Heavy water, natural uranium	do	100 W	1956.
Azur	Enriched uranium	Cadarache	0	1962.
Cabri	do	do	Transient	1963.
Cesar	Natural uranium graphite	do	100 KWt	1964.
EL-1 (Zoe')	Natural uranium, heavy water-moderated	Fontenay-aux-Roses	150 KWt	1948.
EL-2	Natural uranium, heavy water, tank	Saclay	2.5 MWt	1952.
Eole	Heavy water, enriched uranium	Cadarache	1 KWt	1965.
Harmonie	Critical assembly, fast neutron studies	do	2 KWt	1965.
Marius	Natural uranium critical assembly	do	100 W	1960.
Melusine I	Pool, enriched uranium	Grenoble	4 MWt	1958.
Minerve	Enriched uranium, pool	Fontenay-aux-Roses	100 W	1959.
Neraide	Pool	do	1 MWt	1960.
Pegase	Enriched uranium	Cadarache	20-30 MWt	1963.
Peggy	Enriched uranium, critical assembly	do	1 KWt	1961.
Rachel	Critical assembly, plutonium studies on fast neutrons.	Movable	0	1961.
Siloe	90 percent enriched uranium	Grenoble	15 MWt	1963.
Siloette	Pool	do	100 KWt	1964.
Triton	Pool, 20 percent enriched uranium	Fontenay-aux-Roses	7.5 MWt	1959.
Submarine *Proto* (PAT) (prototype a Terre).	Enriched uranium	Cadarache		1964.
Ulysse	90 percent enriched uranium, Argonaut type	Saclay	100 KWt	1961.
EDF-1	Power, natural uranium, graphite	Chinon	70 MWe	1962.
EDF-2	do	do	200 MWe	1964.
EDF-3	do	do	480 MWe	1966.
EL-3	Power, enriched uranium, heavy water	Saclay	17.5 MWt	1957.
G-1	Power, natural uranium, graphite	Marcoule	3 MWe	1956.
G-2	do	do	40 MWe	1958.
G-3	do	do	40 MWe	1959.
Being built:				
Isis	Pool	Saclay	Low	1966.
Masurca	Critical assembly for fast neutron studies	Cadarache		1966.
Osiris	Materials testing, enriched uranium	Saclay	50 MWt	1966.
Rapsodie	Fast neutron breeder	Cadarache	20 MWt	1966.
EDF-4 (also St. Laurent des Eaux I)	Power, natural uranium, gas-cooled, graphite-moderated.	St. Laurent des Eaux, Loire Valley	500 MWe	1968.
EL-4	Power, natural uranium, heavy water, gas-cooled.	Brennilis (Brittany, Northwest France)	75 MWe	1966.
SENA (joint Franco-Belgian project)	Power, pressurized water	Chooz	266 MWe	1966.
Planned:				
Brenda	Research	Cadarache	12-17 MWt	
Rebecca	Triga design		250 MWt	
REMS	Research	Saclay	30 MWt	1966.
EDF-5 (also Bugey 1)	Power, natural uranium	Near Lyons	500 MWe	1970-71.
EDF-6 (also St. Laurent des Eaux II)	Power, natural uranium, gas-cooled	St. Laurent des Eaux, Loire Valley	500 MWe	1968.
Rapsodie II	Power, fast breeder	Cadarache	100-150 MWe	1969.
Franco-German	Power, high-flux reactor project	Grenoble	70 MWt	1970.

GERMANY (WEST)

Operating:				
AEGPR–10	Argonaut	Grosswelzheim	0.1 W	1961.
BER	Aqueous homogeneous	West Berlin	50 KWt	1958.
FR–2	Heavy water cooled and moderated	Karlsruhe	12 MWt	1961.
FRF	Aqueous homogeneous	University of Frankfurt	50–100 KWt	1958.
FRG–1	Pool, 90 percent enriched uranium	Geestacht	5 MWt	1958.
FRG–2	Pool, enriched uranium	do	200 KWt	1963.
FRJ–1 (Merlin)	Pool, 80 percent enriched uranium	Julich	5 MWt	1962.
FRJ–2 DIDO	Enriched uranium, heavy water-moderated	do	10 MWt	1962.
FRM	Pool, light water-moderated and cooled, 20 percent uranium enriched.	Garching (Munich Technical Institute)	4 MWt	1957.
FRMZ	20 percent enriched uranium, Triga	University of Mainz, Mainz	100 KWt	1965.
——	Enriched uranium	Berlin-Charlottenburg	0.1 W	1963.
MZFR	Multipurpose, heavy water-moderated, natural uranium.	Karlsruhe	20 MWt and 50 MWe.	1965.
SAR–1	Argonaut, enriched uranium	Garching	10 KWt	1959.
STARK (former SAR–2)	Argonaut, heterogenous, enriched uranium	Karlsruhe	low	1964.
SUR–100	Solid homogeneous	Garching	1 W	1962.
SUR–100	do	Berlin	1 W	1963.
SUR–100	do	Darmstadt	1 W	1963.
SUR–100	do	Stuttgart	1 W	1964.
SUR–100	do	Hamburg	1 W	1965.
RWE (VAK)	Power, boiling water, 5 percent enriched uranium.	Kahl am Main	15 MWe	1960.
Being built:				
FRG	Enriched uranium	Braunschweig	1 MW	1966.
SNEAK	Fast, critical assembly	Karlsruhe	low	1966.
SUR–100	Solid homogeneous	do	1 W	1966.
SUR–100	do	Aachen	1 W	1966.
SUR–100	do	Ulm	1 W	1966.
SUR–100	do	Kiel	1 W	1966.
SUR–100	do	Bremen	1 W	1966.
PTB	Tank	Braunschweig	1 W	1966.
SWR	Enriched uranium	Stuttgart College of Technology	0.1 W	1966.
——	Medical research, Triga II	Heidelberg at German Institute for Nuclear Medicine.	250 KWt	
AVR	Power, high-temperature, enriched uranium, pebble-bed.	Julich	15 MWe	1966.
GKSS (ship) (or FDR)	Power, pressurized water, ship *Otto Hahn*	Kiel	38 MWe	1967.
HDR	Power, boiling water with nuclear superheat	Kahl am Main	25 MWe	1968.
KRB	Power, boiling water, 2.6 percent enriched uranium.	Gundremmingen	237 MWe	1966.
KWO (formerly KBWP)	Power, pressurized water	Obrigheim	282 MWe	1968.
VEW or KWL	Power, boiling water	Lingen	160 MWe and 90 MWe conv. superheat.	1966.
Planned:				
German-Swiss	Power	Inside German border	600 MWe	
KKN or AKB	Power, CO_2-cooled, heavy water, pressure tube.	Niederaichbach	100 MWe	1968–69.
KNK	Power, compact, sodium-cooled, 6 percent enriched uranium fueled.	Karlsruhe	20 MWe	1968–69.

World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
GHANA				
Planned: IRT		Legon, Ghana		1968.
GREECE				
Operating: Democritus	Pool	Athens	1 MWt	1961.
Planned: ——	Power/desalting			1968–70.
INDIA				
Operating:				
Apsara	Pool	Trombay	1 MWt	1956.
CIR	Natural uranium, heavy water	do	40 MWt	1960.
Zerlina	Critical assembly	do	100 W	1961.
Being built:				
Tarapur (2)	Power, boiling water	Tarapur, North of Bombay	380 MWe	1967.
RAPP (2)	Power, CANDU, heavy water	Rana Pratap Sugar, Rajasthan	400 MWe	1970–71.
Planned: MAPP (2)	Power, Swedish-Indian, natural uranium	Kalpakkam, Madras	400 MWe	1971–72.
INDONESIA				
Operating:				
IRT–1000 (Soviet)	Pool, subcritical assembly	University of Gadjah Mada, Jogdjakarta	0	1961.
——	Triga Mk–II	Bandung Institute of Technology	250 KWt	1964.
Being built: IRT–2000 (Soviet)	Pool	Serpong, near Djakarta	2 MWt	1967.
IRAN				
Being built: ——	do	Tehran University nuclear center	5 MWt	1968.
IRAQ				
Being built: IRT–2000 (Soviet)	do	Salman Pak, near Baghdad	2 MWt	1966.
ISRAEL				
Operating:				
IRR–1	Pool, 90 percent enriched uranium	Nahal Sorek	5 MWt	1960.
Dimona	Power, natural uranium, heavy water	Near Beersheba	26 MWt	1963.
Planned: ——	Power/desalting		200–1,500 MWe	
ITALY				
Operating:				
AGIP	Argonaut	San Donato, near Milan	5 MWt	1963.
CAMEN (RTS–1)	Pool, 20 percent enriched uranium	Near Pisa, San Piero a Grado	5 MWt	1963.
CESNEF	L–54 aqueous homogeneous, 20 percent enriched uranium.	Milan	50 MWt	1959.
Costanza	AGN–201, enriched uranium	University of Palermo	0.1–5 W	1960.

ECO	Heavy water-moderated, organic-cooled, natural uranium.	Ispra	1 KWt	1963.
ISPRA	Tank, enriched uranium, heavy water-moderated.	do	5 MWt	1959.
RANA	Pool, light water-moderated 20 percent enriched uranium.	Casaccia (CNEN Laboratory)	10 KWt	1964.
RB–1	UO_2 pellets, graphite-moderated	Montecuccolino (University of Bologna)	0	1962.
RB–2	Argonaut, 20 percent enriched uranium	do	10 KWt	1963.
RC–1	Triga Mk–II, enriched uranium to 20 percent	Casaccia (CNEN Laboratory)	100 KWt	1960.
RITMO	Heavy water, uranium	do	1 W	1965.
ROSPO	Organic experimental	do	0	1963.
RS–1 Avogadro	Pool, enriched uranium, heavy water-moderated.	Saluggia	5–7 MWt	1959.
SITEN	Training	University of Cagliari		
SELNI	Power, pressurized water	Trino Vercellese	257 MWe	1964.
SENN (Euratom joint R. & D. program).	Power, boiling water, 2 percent enriched uranium.	Punta Fiume (Garigliano River)	150–230 MWe	1963.
SIMEA	Power, natural uranium graphite (British)	Latina	200 MWe	1962.
Being built:				
CNEN	Training	University of Padua	Neglig	1966.
ESSOR	Test, heavy water moderated, 90 percent enriched uranium (Euratom).	Ispra	30 MWt	1967.
RB–3	Enriched uranium	Montecuccolino, (University of Bologna)	10 KWt	1966.
Planned:				
SORA	Pulsed	Ispra	32 MWt	
Triga Mk–II	Enriched uranium, light-water moderated	University of Pavia	250 KWt	1966.
CIRENE	Natural uranium or lightly enriched uranium		20 MWe	1969.
TAPIRO	Fast neutron source	Casaccia (CNEN Laboratory)	5 KWt	1967.
——	Power		600 MWe	
JAPAN				
Operating:				
Hitachi	Pool, enriched uranium	Kawasaki City	100 KWt	1962.
JRR–1	Boiling water, enriched uranium	Tokai Mura	50 KWt	1957.
JRR–2	Heavy water, 90 percent enriched uranium	do	10–20 MWt	1960.
JRR–3	Heavy water, natural uranium	do	10 MWt	1962.
JRR–4	Pool, enriched uranium	do	1 MWt	1965.
Kinki RR	UTR, heterogeneous, enriched uranium	Osaka	0.1 W	1961.
Musashi RR	Triga Mk–II, enriched uranium, critical facility.	Kawasaki City	100 KWt	1963.
Rikkyo University RR	Triga Mk–II	Yokosuka City, St. Paul's University	100 KWt	1961.
Toshiba RR	Pool, enriched uranium	Kawasaki City	30–100 KWt	1962.
University of Kyoto (also Kansai Research Reactor).	do	Kumatori, Osaka	1 MWt	1964.
JAPCO No. 1	Power, CO_2-cooled, natural uranium (British)	Tokai Mura	169 MWe	1965.
JPDR	Power, boiling water, slightly enriched uranium.	do	12.5 MWe	1963.
Being built:				
JMTR	Tank, materials testing	do	50 MWt	1968.
JAPCO No. 2	Power, enriched uranium, boiling water	Tsuruga Peninsula	325 MWe	1969.

World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
JAPAN—Continued				
Planned:				
Chubu Electric Co. (2)	Power	Nr. Owase-Mei-ken	250 MWe and 500	1970-and 1974.
Hokkaido Electric	do		200-300 MWe	1975.
Hokuriku Electric Power Co	do		200 MWe	1980.
Oceanographic vessel	Power, ship propulsion, light water cooled, enriched uranium.		35 MWt	1969.
Kansai Electric Co., (3)	Power	Tsuruga Peninsula	300 MWe	1970, 1972, and 1975.
Kyushu Electric Power Co	do		350 MWe	1974.
Shikoku Electric Power Co	do		350 MWe	1975.
Tokyo Electric Power Co. (3)	do	Fukushima Prefecture	350 MWe; 500 MWe (2).	1970, 1972, and 1974.
KOREA				
Operating: KRR	Triga Mk-II	Seoul	100 KWt	1962.
Planned: ——	Power		150-250 MWe	1971-75.
MEXICO				
Planned:				
——	Triga Mk-III	Mexico City	1000 KWt	1966.
——	Power/desalting	On Gulf of California		
THE NETHERLANDS				
Operating:				
BARN	Pool	Wageningen	100 KWt	1963.
HFR	Tank, high flux, 90 percent enriched uranium	Petten	20 MWt	1961.
HOR	Pool, 90 percent enriched uranium	Delft	100 KWt	1963.
JASON (LFR)	Argonaut, 90 percent enriched uranium	Petten	10 KWt	1960.
KRITO	Pool, critical assembly	do	Low	1963.
SUSPOP	Homogeneous suspension, pulsed critical assembly.	Arnhem	0	1959.
Being built:				
Eindhoven Athene	Argonaut	Eindhoven	10 KWt	1965.
SEP or GKN	Power, boiling water	Dodewaard	50 MWe	1968.
Planned: KSTR	Suspension of UO_2 and ThO_2 in light water	Arnhem	250 KWt	1966.
NORWAY				
Operating:				
HBWR	Boiling heavy water	Halden	20 MWt	1959.
JEEP-1	Natural uranium, heavy water	Kjeller	450 KWt	1951.
NORA	Natural uranium, pool	do	100 W	1961.
Being built: JEEP-2	Spectral shift	do	2MWt	1966.

PAKISTAN				
Operating: ——	Pool	Islamabad, west Pakistan	5 MWt	1965.
Planned:				
——	Power	Rooppur, east Pakistan	70 MWe	
——	Power, heavy water (Canadian)	Karachi, west Pakistan	132 MWe	
PHILIPPINES				
Operating: PRR–1	Pool	Quezon City	1 MWt	1963.
Planned: ——	Power	On Luzon		1970's.
PORTUGAL				
Operating: RPI	Pool	Sacavem	1 MWt	1961.
Planned: Joint Spanish-Portugal	Power	Alcoutim on the Guadiana River	500 MWe	1970.
SOUTH AFRICA				
Operating: Safari I	Tank, heterogeneous enriched uranium	Pelindaba	20 MWt	1965.
SPAIN				
Operating:				
ARBI	Argonaut	Bilbao	10 KWt	1962.
ARGOS	do	Barcelona	10 KWt	1961.
JEN–1	Pool	Moncloa	3 MWt	1958.
Being built:				
UEM	Power, pressurized water	Zorita de los Canes, Guadalajara	153 MWe	1968.
NUCLENOR	Power, boiling water	Santa Maria de Garona	440 MWe	1970.
Planned:				
CENUSA	Power	Castrejon Dam near Madrid	250 MWe	1968.
DON	Power, organic-cooled, heavy water moderated	Madrid	30 MWe	
FECSA (French-Spanish)	Natural uranium fueled	Catalonia, near French border	500 MWe	
Hidroelectrica Espanola (Peniscola)	Power	Castellon de la Plana	250 MWe	1971–72.
Sevillana	do	South of Sevilla on the Guadalquivir River	250 MWe	
SWEDEN				
Operating:				
FR–0	Research	Studsvik	0.01 KWt	1964.
RO	Natural uranium, heavy water	do	50 W	1959.
R1	Natural uranium, heavy water	Stockholm	600 KWt	1954.
R2	Tank, 90 percent enriched uranium	Studsvik	30 MWt	1961.
R2–O	Pool	do	1 MWt	1960.
R–3 (Agesta)	Power, heavy water, natural uranium	Agesta	65 MWt	1963.
Being built: Marviken (R4–EVA)	Power, pressurized water, with nuclear superheat.	Marviken	200 MWe	1968.
Planned:				
Bashful	Power, boiling heavy water		400–500 MWe	1972.
PHWR	Power, homogenized, pressurized water		400 MWe	1972.
SIMPEVARP (OKAB)	Power, boiling water	Kalmar County	400 MWe	1970.

World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
SWITZERLAND				
Operating:				
——	Swimming pool	University of Basel	2 KWt	1959.
Aladin	Solid, homogeneous	University of Geneva	Low	1958.
Diorit	Natural uranium, heavy water	Wurenlingen	20 MWt	1960.
Saphire	Pool	do	1 MWt	1957.
Being built:				
ENUSA (or SNA)	Power, heavy water, gas cooled	Lucens	7.5 MWe	1966.
NOK (Northeast Swiss Power Co.)	Power, pressurized water	Beznau	350 MWe	1969.
Planned:				
Project Consortium	Natural uranium, heavy water	Wurenlingen	30 MWt	
BKW (Bernische Kraftwerke AG) (2)	Power	Berne	250 MWe	
Swiss-German (Zurich Electric—RWE)	Power, pressurized water or boiling water	On the Rhine near Basel	500 MWe	
THAILAND				
Operating: Thailand RR	Pool, heterogeneous enriched uranium	Bangkok	1 MWt	1962.
TUNISIA				
Planned: ——	Power/desalting	Gabes, south Tunisia	Approximately 300 MWe.	
TURKEY				
Operating: TR-1	Pool	Cekmece, near Istanbul	1 MWT	1962.
UNITED ARAB REPUBLIC				
Operating: VVR-S	Tank	Inchass	2 MWt	1961.
Planned: ——	Power/desalting	Borg-el-Arab	150 MWe	
UNITED KINGDOM				
Operating:				
BEPO	Graphite-moderated, natural uranium	Harwell, Berkshire	6 MWt	1948.
Consort	Modified argonaut	Imperial College of Science & Technology, Surrey.	100 KWt	1964.
DAPHNE	Heavy water-moderated, highly enriched uranium, research.	Harwell, Berkshire	100 Wt	1962.
DIDO	Heavy water-moderated, highly enriched uranium.	do	15 MWt	1956.
DIMPLE	Research, light or heavy water or organic moderated.	Winfrith, Dorset	100 Wt	1962.

DMTR	Heavy water-moderated, highly enriched uranium.	Dounreay, Caithness	13 MWt	1958.
Dragon	High-temperature, He-cooled, graphite-moderated, enriched uranium.	Winfrith, Dorset	20 MWt	1964.
GLEEP	Graphite-moderated, research	Harwell, Berkshire	3 KWt	1947.
Herald	Light water-moderated, highly enriched uranium.	Aldermaston, Berkshire	5 MWt	1959.
Hero	Graphite-moderated, enriched uranium oxide	Windscale, Cumberland	3 KWt	1962.
Hector	Heated reactivity experimental	Winfrith, Dorset	100 Wt	1963.
Horace	Light water-moderated, highly enriched uranium.	Aldermaston, Berkshire	10 Wt	1958.
Jason	Training	Royal Naval College	Low	1962.
Juno (formerly Nero)	Water moderated experimental	Winfrith, Dorset	100 Wt	1964.
Lido	Light water moderated, tank	Harwell, Berkshire	100 KWt	1956.
Neptune (Rolls Royce)	Zero energy experimental	Derby	100 Wt	1963.
Nestor	Neutron source thermal	Winfrith, Dorset	30 KWt	1961.
Northern universities	Research, graphite moderated, water-cooled	Risley, Lancashire	100 KWt	1964.
Pluto	Heavy water-moderated, highly enriched uranium.	Harwell, Berkshire	15 MWt	1957.
Queen Mary College	UTR design, critical assembly	Queen Mary College, London	A few watts	1964.
Scottish universities	Research, UTR–100	East Kilbride, Scotland	100 KWt	1963.
Vera	Highly enriched uranium, fast reactor research	Aldermaston, Berkshire	100 Wt	1961.
Zebra	Zero power fast reactor	Winfrith, Dorset	100 Wt	1962.
Zenith	Zero power high temperature, gas-cooled	do	100 Wt	1959.
AGR	Power, prototype CO_2-cooled, graphite-moderated, enriched uranium oxide.	Windscale, Cumberland	35 MWe	1962.
Berkeley No. 1	Power, CO_2-cooled, graphite-moderated, natural uranium.	Gloucestershire	145 MWe	1961.
Berkeley No. 2	do	do	145 MWe	1962.
Bradwell No. 1	do	Essex	160 MWe	1961.
Bradwell No. 2	do	do	160 MWe	1962.
Calder Hall A (2)	Power, Pu production, CO_2-cooled, graphite-moderated, natural uranium.	Calderbridge, Cumberland	45 MWe each	1956.
Calder Hall B (2)	do	do	45 MWe each	1958, 1959.
Chapelcross (4)	do	Dumfriesshire, Scotland	45 MWe each	1959.
Dounreay fast reactor	Power, enriched uranium, fast breeder	Dounreay, Caithness	60 MWt	1959.
Dungeness No. 1	Power, CO^2-cooled, graphite-moderated, natural uranium.	Kent	275 MWe	1965.
Dungeness No. 2	do	do	275 MWe	1966.
Hinckley Point No. 1	do	Somerset	250 MWe	1964.
Hinckley Point No. 2	do	do	250 MWe	1964.
H.M.S. *Dreadnaught*	Power, submarine (*Skipjack* class)			1962.
Hunterston No. 1	Power, CO^2-cooled, graphite-moderated, natural uranium.	Androssan, Scotland	165 MWe	1963.
Hunterston No. 2	do	do	165 MWe	1964.
Sizewell No. 1	Power, CO^2-cooled, natural uranium	Suffolk	290 MWe	1965.
Sizewell No. 2	do	do	290 MWe	1965.
Submarine reactor	Land-based prototype	Dounreay, Caithness		1965.
Trawsfynydd No. 1	Power, CO^2-cooled, graphite-moderated, natural uranium.	Meriontheshire, Wales	250 MWe	1964.
Trawsfynydd No. 2	do	do	250 MWe	1964.

World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
UNITED KINGDOM—Continued				
Being built:				
H.M.S. *Churchill*	Power, submarine	Barrow-in-Furness		1967.
H.M.S. *Renown*	Power, *Polaris* submarine	Birkenhead, Cheshire		1968–69.
H.M.S. *Resolution*	do	Barrow-in-Furness		1968.
H.M.S. *Valiant*	Power, submarine (hunter-killer)	do		1966.
H.M.S. *Warspite*	Power, submarine propulsion (hunter-killer)	do		1966.
Oldbury No. 1	Power, CO_2-cooled, graphite-moderated, natural uranium.	Gloucestershire	300 MWe	1966.
Oldbury No. 2	do	do	300 MWe	1966.
SGHW	Power, heavy water-moderated, light water-cooled, enriched uranium.	Winfrith, Dorset	100 MWe	1967.
Wylfa Head No. 1	Power, CO_2-cooled, graphite-moderated, natural uranium.	Anglesey	590 MWe	1968.
Wylfa Head No. 2	do	do	590 MWe	1969.
Planned:				
PFR	Prototype, fast reactor	Not announced		
——	Fast breeder reactor	Dounreay	250 MWe	
Dungeness B (2)	Power, AGR-type, CO_2-cooled, graphite-moderated, enriched uranium oxide.	Kent	1,200 MWe	1970.
Hinkley Point B	Power (type undetermined)	Somerset	1,200–1,500	1970–71.
H.M.S. *Repulse*	Power, *Polaris* submarine	Barrow-in-Furness		
H.M.S. *Revenge*	do	Birkenhead, Cheshire		
VENEZUELA				
Operating: RV–1	Pool	Caracas	3 MWt	1960.
VIETNAM				
Operating: Triga Mk–II	Research, pool	Dalat	250 KWt	1963.
YUGOSLAVIA				
Operating:				
RA	Heterogeneous heavy water	Vinca	7–10 MWt	1959.
RB	do	do	0	1958.
Being built: ——	Triga Mk–II	Ljubljana	100 KWt	1966.
Planned: ——	Power	Northern Croatia	350 MWe	
SOVIET BLOC				
BULGARIA				
Operating: IRT–1000	Pool, 10-percent enriched uranium	Institute of Physics, near Sofia	2 MWt	1961.

RED CHINA				
Operating: TBR–S	Heavy water, 2-percent enriched uranium	Peking, Institute of Atomic Energy	7–10 MWt	1958.
CZECHOSLOVAKIA				
Operating: VVR–S	Pool, 10-percent enriched uranium	Rez	2 MWt	1957.
Being built: KS–150	Power, heavy moderated, natural uranium	Bohunice	150 MWe	1966.
EAST GERMANY				
Operating:				
VVR–S	Tank	Dresden	2 MWt	1957.
——	Pool	Rossendorf	10 KWt	1962.
——	do	do	0	1962.
Being built: ——	Power, heavy water	Neuglobsow	70 MWe	
HUNGARY				
Operating: VVR–S	Tank, 10-percent enriched uranium	Central Institute of Physical Research, near Budapest.	2 MWt	1959.
Being built: KFKI	Critical assembly	Csillesberg, near Budapest	0	
LATVIA				
Operating: IRT–C	Research, light water, 10-percent enriched uranium.	Salaspils	2 MWt	1961.
POLAND				
Operating:				
ANNA	Research, U^{235} fueled, graphite, light water	Swierk	0	1963
EWA (Soviet)	Tank, light water-moderated fueled with 10 percent enriched uranium.	do	2 MWt	1958.
Maryla	Swimming pool	do	1–10 KWt	1963.
Planned:				
——	Research, high flux	do	30 MWt	
——	Power	Pomeric	200 MWe	1975.
RUMANIA				
Operating: WWR–C	Tank	Bucharest	2 MWt	1957.
U.S.S.R.				
Operating:				
ARBUS	Liquid, organic moderated and cooled	New Melekess	0.750 MWe	1963.
BFS	Fast critical facility	Obninsk	0	1961.
BR–1	Plutonium oxide, research	do	0	1957.
BR–5 (formerly BR–2)	Sodium-cooled, fast reactor	do	5 MWt	1959.
Fursov Pile	Graphite	Moscow Institute of AE	500 KWt	1946.
IBR	Uncooled, fast neutron pulse	Dubna	Variable	1960.
IRT (rebuilt)	Light water, tank-type, 36 percent enriched uranium.	Moscow Atomic Energy Institute	4 MWt	1963.

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World reactors—Other than the United States—Continued

Country and designation	Type	Site	Output	Criticality
U.S.S.R—Continued				
Operating—Continued				
IRT-A	10 percent enriched uranium	Moscow Institute of Physical Engineering	2 MWt	1962.
IRT-B	Light water, 10 percent enriched uranium	Tbilisi	2 MWt	1959.
IRT-D	do	Tomsk	1 MWt	1962.
IRT-E	Light water, pool-type, 10 percent enriched uranium.	Sverdlovsk	1 MWt	1962.
IRT-2000	Light water, 10 percent enriched	Minsk	1 MWt	1962.
Lenin (3)	Ship propulsion		90 MWt (each)	1962.
Nuclear submarines (26 according to "Jane's Fighting Ships").	Propulsion			
OR	Organic, 10 percent enriched uranium	Moscow Institute of AE	300 KWt	1962.
ROMASHKA (Daisy)	Compact thermoelectric prototype	do	500–800 Wt	1964.
RPT III (MR-2)	Light water cooled, tank, graphite-moderated, 90 percent enriched uranium.	Moscow Atomic Energy Institute	20 MWt	1963.
SM-2	Light water moderated and cooled	Melekess	60–100 MWt	1962.
TVR (rebuilt)	Heavy water, 2 percent enriched uranium	Moscow Institute of Experimental Physics	2.5 MWt	1957.
VVR-2 (rebuilt)	Light water	Moscow Atomic Energy Institute	3 MWt	1955.
VVR-M	Light water, tank, 20 percent enriched uranium.	Leningrad	10 MWt	1959.
VVR-M	do	Kiev	10 MWt	1963.
VVR-C or S	Light water, tank, enriched uranium	Moscow State University	2 MWt	1955.
Do	do	Tashkent	2 MWt	1959.
AM-1	Power, graphite-moderated, pressurized water	Obninsk	5 MWe	1954.
AMB-1 (also known as Beloyarsk No. 1).	Power, 1.5 percent enriched uranium oxide boiling water superheat.	Beloyarsk (Urals Atomic Power Station)	100 MWe	1963.
TES-3	Mobile powerplant	Obninsk	9 MWt	1961.
Siberian nuclear powerplant (6)	Power, graphite, natural uranium	Troitsk	100 MWe	1st, 1958.
VVPR-1 (1 of 2)	Power, pressurized water	Novo Voronezh	240 MWe	1964.
Being built:				
IRT-A	Light water	Moscow	2 MWt	1966.
IRT-E	Research, pool	Sverdlovsk	2 MWt	1966.
Nuclear submarines (several known to be under construction).				
VVR-K or TS	Light water	Alma-Ata, Kazakh	10–20 MWt	1966.
AMB-2 (2 of 2) (also known as Beloyarsk II).	Power, pressurized water	Beloyarsk	200 MWe	1966.
——	Power, boiling water	Melekess	50 MWt	
BN-60	Power, fast test reactor	do	60 MWt	1969.
BN-350	Power/desalting	Shevchenko	300 MWe	1968–69.
——	Power	Near Sverdlovsk	1,000 MWe	1966.
VVPR-2 (2 of 2)	Power, pressurized water	Novovoronezh	360 MWe	1968.
Planned:				
Nuclear icebreakers (2)	Pressurized water			1971.
Dual purpose	Power/desalting	Zhdanov area	3,500 MWe	

APPENDIX 16

EXTRACTS FROM REPORT ON THE ACTIVITIES AND ACCOMPLISHMENTS OF THE JOINT COMMITTEE ON ATOMIC ENERGY IN THE 89TH CONGRESS, 2D SESSION (1966) [1]

FOREWORD

The following report on the activities of the Joint Committee on Atomic Energy during the second session of the 89th Congress (1966) has been prepared at the direction of the Chairman for the information of the Congress, the Executive Branch, and the public.

The Joint Committee on Atomic Energy was first organized on August 2, 1946, and is a House-Senate Committee consisting of nine members from each body, of which no more than five from each body can be members of the same party.

* * * * * * *

The Joint Committee is one of the few committees established by statute, rather than by rule of each house, and is unique in several respects. For example, it is the only Joint Committee of the Congress with legislative functions, including the receipt and reporting of legislative proposals. The Committee is also charged by law with legislative responsibility as "watchdog" of the United States atomic energy program. As part of its responsibilities, the Committee follows closely the classified activities of executive agencies, including the Atomic Energy Commission and the Departments of Defense and State, concerning the military applications of atomic energy.

Of equal importance, the Committee plays a major role in stimulating the peaceful applications of the atom. For example, the Committee has encouraged such programs as the development of civilian nuclear power, the preservation of food through irradiation, the application of nuclear power in space, and the large-scale combining of production of nuclear power and the desalting of sea water.

One of the crucial matters facing the country has been the issue of the dangers of the spread of nuclear weapons. In this connection a detailed and thorough review of the problem of proliferation of nuclear weapons was held by the Joint Committee in connection with Senate Resolution 179.

In all these activities, the Joint Committee on Atomic Energy as representative of Congress and the public seeks to assure the implementation of the following statutory policy expressed in the Atomic Energy Act of 1954: ". . . the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security . . . ."

During the 89th Congress, second session, the Joint Committee met on a total of 73 different occasions, 55 of which were public and 18 of which were executive meetings. In addition to three Joint Committee reports which were filed on pending legislation, the Senate members of the Committee also reported favorably on a Senate resolution (S. Res. 179) concerning the nonproliferation of nuclear weapons. Committee meetings during the 89th Congress, first and second sessions, total as follows: First session 86, second session 73, total 159.

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I. LEGISLATIVE ACTIVITIES

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D. AEC "Omnibus" Bill for 1966 (H.R. 16211; S. 3617)

On June 30, 1966, the Atomic Energy Commission transmitted to Congress its proposed "omnibus" legislation for 1966. The Commission submits such bills from time to time to effect miscellaneous amendments to the atomic energy legislation. The last such bill was enacted in 1964.

The latest proposed legislation is intended to make two substantive changes in the law relating to atomic energy. First, it is proposed to delete the requirement

[1] The selected sections of the report set forth below are those dealing with the international aspects of the atomic energy program. The report is set forth in its entirety in the Congressional Record of Oct. 20, 1966 (daily edition), beginning at p. 27103.

in section 41 b. of the Atomic Energy Act of 1954 that the President make an annual determination of the quantities of special nuclear material to be produced by the AEC and the amounts to be available for distribution domestically and abroad pursuant to sections 53 and 54 of the Act. Second, it is proposed that section 5 of the EURATOM Cooperation Act of 1958 be amended to permit implementation with respect to EURATOM of the AEC's authority to provide uranium enrichment services. (See item III H. below.)

The AEC's recommended bill was introduced on July 13, 1966, by Chairman Holifield (by request) as H.R. 16211, on July 15, 1966, by Vice Chairman Pastore (by request) as S. 3617.

Hearings on this bill were held on August 30, 1966, before the Subcommittee on Legislation of the Joint Committee. On October 12, 1966, Chairman Holifield wrote to the AEC and noted that the Committee is not aware of any urgent need for enactment of this bill during the current session of Congress, and that passage of the bill during the current session was not feasible. Chairman Holifield suggested that the Commission consider resubmission of the bill early next year.

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F. Nonproliferation of Nuclear Weapons

On January 18, 1966, Senator John O. Pastore, Vice Chairman of the Joint Committee, introduced in the Senate a resolution (S. Res. 179) commending the President's serious and urgent efforts to negotiate international agreements limiting the spread of nuclear weapons. This resolution was cosponsored by 58 other Senators.

The Joint Committee held hearings on S. Res. 179 on February 23, March 1 and 7, 1966. Witnesses at these hearings were the Secretary of State, Dean Rusk; the Secretary of Defense, Robert S. McNamara; the Chairman of the Atomic Energy Commission, Glenn T. Seaborg; and the Director of the Arms Control and Disarmament Agency, William C. Foster.

At these hearings, the witnesses testified in support of S. Res. 179 and stressed the imperativeness of reaching a nonproliferation treaty.

The Senate members of the Joint Committee voted favorably to report out S. Res. 179 on April 28, 1966. The Senate Foreign Relations Committee filed its favorable report on S. Res. 179 on May 11, 1966. Senate Resolution 179 was considered on the Floor of the Senate on May 17, 1966, and, following debate, was approved 84 to 0.

Chairman Chet Holifield submitted a similar resolution in the House (H. Res. 673). It and eleven other similar resolutions are pending before the House Foreign Affairs Committee.

II. AGREEMENTS FOR COOPERATION

Section 123 of the Atomic Energy Act of 1954 requires that agreements for cooperation in the peaceful uses of atomic energy be submitted to and lie before the Joint Committee for a period of thirty days while Congress is in session before becoming effective. Pursuant to this requirement ten civil agreements were submitted to the Committee by the Department of State and the Atomic Energy Commission during 1966. Each of these proposed agreements was the subject of a public hearing before the Subcommittee on Agreements for Cooperation.

Of the ten agreements considered by the Committee, four were new civilian power agreements under which the United States gave long-term assurances as to the availability of nuclear fuel for reactors constructed under the cooperating countries' atomic power programs. These agreements are with the countries of Spain, Switzerland, Sweden, and the United Kingdom. All four agreements provide for the transfer to the International Atomic Energy Agency (IAEA) of the responsibility for applying safeguards to the facilities and materials transferred pursuant to the agreements. This responsibility entails periodic inspections of the facilities involved to insure against the diversion of fissionable materials to military purposes.

Amendments to six research-type agreements for cooperation were also submitted to the Joint Committee during the session. The countries whose agreements were affected by these amendments were Turkey, Israel, Indonesia, the Philippines, the Republic of China, and the United Kingdom. Most of the amendatory agreements extended the terms of the basic agreements and authorized an increase in the amount and the enrichment of the special nuclear material which could be transferred thereunder. Pursuant to the United States policy of transferring safeguards responsibilities to the IAEA, a policy which the Joint Committee thoroughly supports, provision was made in the Indonesian and Turk-

ish amendments for bringing facilities in those countries receiving United States assistance under international safeguards. The Philippine, Chinese, and Israeli agreements had been amended earlier to provide for assumption of this responsibility by the IAEA.

In addition to the foregoing agreements for cooperation, a proposed draft Memorandum of Cooperation between the United States and the Soviet Union was the subject of a Joint Committee open hearing. Neither the existing nor the contemplated agreement with the Soviet Union provides for the transfer of any atomic energy materials or classified information; they encompass only exchanges of scientific delegations and unclassified information on stipulated subjects.

At the urging of the Committee, the Atomic Energy Commission is developing a program for bringing foreign chemical processing facilities under safeguards. These are facilities capable of separating plutonium—a nuclear weapon component—from irradiated reactor fuels. Among other things, the Commission is working with other Federal agencies to assure that important specialized items of equipment specifically designed or intended for use in chemical processing plants will be exported only pursuant to agreements including safeguards provisions, and to restrict the design and engineering services provided in connection with chemical processing plants to be built abroad. The Committee is following this program closely because chemical processing facilities are a critical control point in assuring that a nation is not using nuclear materials for other than peaceful purposes.

III. INFORMATIONAL HEARINGS

As noted in Section I of this report the Joint Committee during the second session of the 89th Congress, held extensive hearings as part of its legislative activities. In addition, the Committee conducted a number of informational hearings in both public and executive session on a wide range of subjects. Highlights of the Committee's informational hearings follow:

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D. Special Nuclear Material Accountability

The Joint Committee has followed most closely the methods of assuring against the diversion of special nuclear material. Particular emphasis has been given to assessing the adequacy of AEC's practices and procedures for insuring that special nuclear material is adequately accounted for. During an executive hearing on February 15, 1966, a public hearing on August 4, 1966, and at several Committee staff meetings with representatives of other governmental agencies, this matter has been kept under continuous review.

The Joint Committee also urged the Atomic Energy Commission to develop a procedures manual to insure that an adequate inspection mechanism is developed to prevent unauthorized diversion of nuclear materials from reprocessing plants. In this connection, the AEC subsequently entered into a contract with the Nuclear Fuel Services, Inc. to develop such a manual.

The Committee further urged the Commission to restrict the flow overseas of information concerning chemical reprocessing plants unless the recipient country agreed to place the facility under IAEA or equivalent international safeguards. This is discussed further in section II.

In regard to the safeguarding of nuclear materials, the Committee recommended the establishment of an independent panel to review AEC's current procedures for safeguarding special nuclear material and to recommend improvements where necessary. The Commission established an Ad Hoc Advisory Panel to conduct a review of its current and proposed policies and procedures for safeguarding special nuclear materials in the interest of common defense and security on July 22, 1966.

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F. Ad Hoc Uranium Barter Transactions

The Private Ownership of Special Nuclear Materials Act (Public Law 88–489) provided that the AEC might begin to provide a uranium enrichment service only after December 31, 1968 (see item III H, below). However, as noted in the Joint Committee's Report on the private ownership bill, the AEC possesses authority under the existing language of the Atomic Energy Act of 1954 to barter enriched uranium distributed to foreign projects pursuant to section 54 of the Act and to accept as partial payment normal uranium to be delivered to the Commission purusnat to section 66 of the Act. It was understood the Com-

mission might wish to enter such arrangements on an *ad hoc* basis pending the date on which uranium enrichment services become available.

In accordance with this authority, the AEC proceeded to negotiate a number of barter transactions with foreign reactor operators. On several occasions the Committee expressed concern about the increasing number of barter projects that were being considered. The Committee emphasized to the AEC that the special provision for *ad hoc* barter arrangements during the intervening period before commencement of uranium enrichment services was not intended as a means of circumventing the basic policy decision concerning the starting date for this service.

The Joint Committee received testimony on this subject from the Commission in executive session on March 2, 1966, at which time a detailed review of the entire uranium barter program, including the AEC's future plans therefor, was conducted. On March 11, 1966, the AEC announced that no further barter arrangements would be considered other than the already approved barter fuel supply arrangements for five power reactor projects in three European countries.

G. Transfer of Additional Plutonium to EURATOM

On July 18, 1966, the Committee received testimony in executive session from the Secretary of State and the Atomic Energy Commission on a variety of civilian international atomic energy matters, including a request by EURATOM for transfer of an additional 1,000 kilograms of plutonium for experiments in the fast breeder reactor field. The present ceiling on AEC transfers of plutonium to EURATOM, contained in the EURATOM Cooperation Act of 1958, is 500 kilograms.

On September 1, 1966, the Atomic Energy Commission transmitted to Congress a request for an amendment to the EURATOM Corporation Act of 1958 to authorize transfer of the additional 1,000 kilograms of plutonium. This proposed legislation was introduced on September 7, 1966, by Chairman Holifield (by request) as H.R. 17557, and by Vice Chairman Pastore (by request) as S. 3808. No further action was taken by the Joint Committee in view of the lateness in the session when the Administration requested the legislation and since the additional plutonium desired by EURATOM was not needed this year. The Committee will be prepared to consider this matter again in the future.

H. Toll Enriching Services and Related Matters

The "private ownership" amendments to the Atomic Energy Act of 1954, which were enacted in 1964, authorize the AEC to utilize its facilities to provide a uranium enrichment (commonly known as "toll enrichment") service for domestic and foreign customers after December 31, 1968. Enriched uranium is used as a fuel for nuclear power reactors. The Act requires the AEC to establish criteria in writing setting forth the terms and conditions under which these services shall be made available, and further requires that these criteria shall be submitted to the Joint Committee for a statutory forty-five day waiting period before becoming effective.

On July 1, 1966, the AEC submitted to the Joint Committee proposed "Uranium Enrichment Services Criteria" in accordance with the Act. The Joint Committee immediately announced that public hearings would be held on these criteria and related matters. The Committee also requested the Comptroller General to review these criteria and the contracts which the AEC planned to use to provide the services.

On August 2, 3, and 4, 1966, the Atomic Energy Commission testified in public session before the Committee. Included in the topics covered were the AEC's post-1968 policies on lease and sale of uranium, uranium reserves, and requirements and safeguards against diversion of fissionable material to unauthorized uses.

After allowing a period for review of the Commission's testimony, the Committee on August 16 and 17 heard from a representative group of witnesses representing various segments of private industry. Additional subjects covered in these hearings included competition and economics in the nuclear fuel cycle, and possible private ownership of gaseous diffusion plants.

The five days of hearings on these matters afforded an opportunity for a comprehensive public analysis of the AEC's uranium enrichment services criteria, which are expected to be of great significance to the nuclear power industry in this country and abroad. The hearings also provided a full-scale review of developments in the civilian nuclear power industry since the 1964 private ownership hearings, and highlighted the problem areas which will require attention in future years. Some modification in the AEC's proposed Uranium Enrichment Services Criteria is expected resulting from the Joint Committee's review.

IV. CLASSIFIED ACTIVITIES

In addition to open hearings, the Joint Committee conducted a number of hearings in executive session on classified matters. These hearings covered a broad range of subjects concerning the relationship of nuclear energy to the worldwide national security interests of the United States. Highlights of the Committee's executive hearings and other classified activities follow.

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C. Four Safeguards Under the Limited Test Ban Treaty

In connection with the four safeguards established at the time of the signing of the nuclear test ban treaty, the Joint Committee on Atomic Energy has monitored their implementation very closely. Periodic reports have been made to the Congress.

Safequard #1 is the Continuance of the Underground Testing Program. The Joint Committee this year recommended that $10 million be added to the AEC's request for this program for FY 1967. This additional sum was authorized by the Congress. The Administration after authorization found it necessary to take additional reprogramming actions to better fund this safeguard.

Safeguard #2 is the Maintenance of Modern Weapons Laboratories. The Joint Committee continues to be instrumental in helping to maintain the AEC's three nuclear weapons laboratories at levels that provide challenging research and development programs in weapons and related scientific research.

Safeguard #3 is Readiness to Resume Atmospheric Testing. In this connection the Joint Committee has monitored this program and a member of the staff has participated in the annual exercise held in the Pacific known as Operation Windlass.

Safeguard #4 is Test Detection and Monitoring of Foreign Nuclear Programs. The Joint Committee has in its periodic briefings from the CIA continued to follow closely the progress of foreign nuclear programs and our ability to satisfactorily monitor them. In connection with test detection capabilities, Joint Committee interests are indicated on V C. of this report.

D. Safeguarding Naval Nuclear Propulsion Information

The Joint Committee met with representatives of the Executive Branch on several occasions to hear testimony concerning the possible transfer, either directly or indirectly, of naval nuclear propulsion information and technology to foreign nations. The Joint Committee has taken a strong and consistent position that it is not in the national interest to allow this information to be sent abroad because of the danger of its falling into the hands of hostile powers. Also the Committee felt that it was inconsistent with the U.S. policy of nonproliferation.

E. Loss and Recovery of Nuclear Weapons in the Mediterranean Area

On January 17, 1966, a B–52 SAC bomber with 4 nuclear weapons on board and a KC–135 aircraft refueling tanker collided and exploded above the Mediterranean Sea off the coast of southern Spain. Two thermonuclear bombs fell essentially undamaged, one on land and the other into the Mediterranean. The two other nuclear weapons dropped on Spanish soil. The high explosive (not the nuclear) components of the weapons exploded on impact, scattering plutonium and uranium from the nuclear components over the countryside.

The Joint Committee on Atomic Energy followed closely the matters of removing the contaminated soil from Spain and the recovery of the lost bomb from beneath the surface of the Mediterranean Sea. Executive sessions relating to this incident were held on January 20, February 2, and April 19, 1966. A staff member of the Joint Committee also visited the area where the weapons had fallen for firsthand knowledge of the matter. The United States arranged for the proper decontamination of the area near Palomares, Spain, involved in this incident. This operation involved the removal of approximately 1,600 tons of soil. This soil was shipped to the United States and buried at the AEC's Savannah River plant in South Carolina.

The thermonuclear bomb which fell into the Mediterranean was recovered on April 7, almost 80 days after the accident. It was found essentially intact and returned to the United States for examination.

It is to the great credit of the AEC and DoD that safety features designed into these weapons prevent nuclear explosions from taking place in such accidents.

V. OTHER ACTIVITIES

A. IAEA 10th General Conference

The Joint Committee, through staff representation, participated in the 10th General Conference of the International Atomic Energy Agency in September 1966. Chairman Holifield took special recognition of the 10th anniversary of the International Atomic Energy Agency and addressed a congratulatory communication to the Director. The message encouraged efforts of the IAEA in the field of inspection of national programs on the development of atomic energy to insure that uranium and plutonium are not diverted for military purposes.

B. Disarmament Negotiations

On Janurary 24, 1966, the Committee received testimony in executive session concerning the plans and policy position to be taken by the U.S. representative to the 18-Nation Disarmament Conference (ENDC). This Conference met in Geneva from January 27, 1966, to August 25, 1966. A Committee staff member visited the Conference during May 1966, and the Committee received briefings on matters relating to disarmament throughout the year.

C. Detection and Identification of Underground Nuclear Explosions

The Joint Committee has continued to follow actively the research program—known as Vela Underground—on detection and identification of underground nuclear explosions. The most recent executive hearing on this subject was held on June 21, 1966. Witnesses represented the Arms Control and Disarmament Agency, Department of Defense, and the Atomic Energy Commission.

The Joint Committee believes that while progress in seismic research has been made since 1963 no adequate basis exists for the monitoring of a comprehensive test ban treaty without adequate numbers and types of on-site inspections.

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