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August 23, 1955

COPY NO. 25

ATOMIC ENERGY COMMISSION

POSITION PAPER FOR GUIDANCE OF U.S. PARTICIPANTS IN FORTHCOMING INTERNATIONAL TECHNICAL DISCUSSIONS ON SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY UNDER PROPOSED CHARTER OF INTERNATIONAL ATOMIC ENERGY AGENCY

Note by the Secretary

The General Manager has requested that the attached papers be circulated for the information of the Commission.

Enclosure I - Memo from Drs. English and Rine to Paul Foster Dated August 9, 1955, Subject: Technical Conference on Safeguarding Peaceful Uses of Atomic Energy, with two attachments:

A. Policy Questions
B. Position Paper

Enclosure II - Memorandum from General Manager to Chairman, MLC, dated August 10, 1955, Subject: Draft Position Paper, etc.

Enclosure III - Letter from Chairman, MLC, to General Manager dated August 11, 1955

Enclosure IV - Memo from J. W. Crawford to General Manager dated August 11, 1955, Subject:

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Technical Conference on Safeguarding
Peaceful Uses of Atomic Energy

Enclosure V - Memo Dr. Thornton to Dr. Fine,
dated August 5, 1955.

Enclosure VI - Memo Dr. Thornton to General Manager,
dated August 5, 1955

Enclosure VII - Memo Dr. Thornton to Dr. English,
dated August 9, 1955

W. B. McCOOL

Secretary

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ENCLOSURE I

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 9, 1955

MEMORANDUM

TO : Paul F. Foster, Special Assistant to the General Manager

FROM : S. G. English and P. C. Fine

SUBJECT: TECHNICAL CONFERENCE ON SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY

As you requested, the group which prepared the report of June 29, 1955, answering the questions asked by Mr. Stassen on disarmament was reconvened yesterday to consider the August 5 paper prepared by Paul C. Fine on the above subject. This paper consisted of a statement of policy questions relating to the conference together with answers assumed for purposes of discussing the U. S. position at the conference. The second section contains the agenda as accepted and outlines, in discussion form, the proposed U. S. position.

Attached, for further distribution, are six copies of this paper as revised yesterday by the group. The revisions are not major and I believe the paper has the concurrence of all members of the group.

Attachments:
Policy questions and
Position paper

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August 9, 1955

POLICY QUESTIONS RELATED TO TECHNICAL CONFERENCE ON SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY

1. In view of the bilateral agreements between the United States and a large number of other countries,

   a. Does the United States still desire that a multilateral arrangement for establishing an international agency for atomic energy go forward? (An affirmative answer is assumed.)

   b. Does the United States still desire that the Soviet Union participate in the international agency? (An affirmative answer is assumed.)

   c. Would the international agency replace or would it supplement the bilateral agreements? (It is assumed that while the Agency may, in the beginning, supplement the bilateral agreements, it will eventually become an important mechanism for allocation and control of fissionable materials for peaceful international purposes.)

2. In view of the fact that large atomic power reactors will either contain or be capable of producing significant amounts of fissionable material and will therefore have military potentialities,

   a. Is the United States willing to see such reactors constructed in other countries? (An affirmative answer is assumed with respect to all countries participating in the Agency.)

   b. Does the United States contemplate that large amounts of fissionable material for such reactors will be provided to the international agency? (An affirmative answer is assumed, with the amounts of material being greatly in excess of the 200 kilograms presently earmarked by the United States for use in other countries. It is further assumed that all fissionable materials produced in reactor operations with Agency material will also be controlled by the Agency.)

   c. Does the United States contemplate that such reactors will be subjected to inspection by the international agency to insure that materials provided and produced are not diverted to unauthorized uses? (An affirmative answer is assumed, with complete rights of access, measurement, and surveillance for the reactors and related chemical and metallurgical facilities.)

POSITION PAPER CONCERNING
TECHNICAL CONFERENCE ON SAFEGUARDING
PEACEFUL USES OF ATOMIC ENERGY

A technical conference is to be held on the subject of "Safeguarding Peaceful Uses of Atomic Energy" in Geneva, Switzerland, starting on August 22, 1955, and lasting for not more than five days. Delegations from the United States, the Soviet Union, the United Kingdom, and Canada will participate. The agreed agenda for the conference is as follows:

Agenda for Discussions on

Safeguarding Peaceful Uses of Atomic Energy

To discuss the safeguards required for the following peaceful uses of atomic energy under an international atomic energy agency:

1. Research and Development

   a. Reactors for production of radioisotopes for use in science, medicine, agriculture, and industry.

   b. Reactors to provide neutron irradiations for scientific research and for testing materials and components for power reactors.

   c. Reactors as pilot plants for the development and demonstration of economic atomic power.

2. Large-Scale Utilization of Atomic Power

   a. Power reactors using as fuel either natural uranium or uranium partially enriched in U-235, but not containing thorium.

   b. Power reactors using as fuel either plutonium, U-233, or uranium highly enriched in U-235, but not containing thorium or significant amounts of U-238.

   c. Reactors containing the fertile materials U-238 or thorium for the specific purpose of producing fissionable material in addition to power.

Safeguards are to be considered in relation to the design and construction of reactors, allocation and preparation of critical materials, operation of reactors, and processing of irradiated materials.

Discussion

The United States considers that the purpose of the conference is to discuss the agenda items from a scientific and technical viewpoint, without attempting to reach any formal

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agreement. Information on the agenda items is given below for the guidance and use of the United States Delegation. The time, manner, and extent of use of this information is left to the United States Delegation to determine.

The agenda items are related to technical aspects of the statute for an international atomic energy agency that was drafted by representatives of the United States and other countries and was transmitted to the Soviet Union on July 29, 1955. This relationship may of course be recognized and discussed in general terms, but consideration of the statute itself should be deferred for later action by the countries concerned.

The agenda items are also related to the international control of atomic energy in connection with disarmament. This relationship may be discussed in general terms, but any specific disarmament matters should be deferred for consideration by the United Nations Disarmament Subcommittee, which is to meet in New York on August 29, 1955.

Additional information may be given in the conference discussions if required by the United States Delegation, provided that such information is unclassified. In connection with purportedly hypothetical cases involving particular power reactor complexes, especial care should be used to avoid making assumptions of intelligence value to the USSR for deducing either our current or anticipated materials production posture. The "Geneva assumptions" as reported by U.S.A. authors should constitute the boundaries for any concrete assumptions and selection of data from ranges in such reports should not be permitted. In particular, assumptions dealing with exposure levels, relative importance and costs of fuels and products, isotopic concentrations in reactor products and the associated problems created, power reactor by-products other than those mentioned herein, and integrability of various kinds of devices into an existing production complex should be avoided.

In regard to Item 1 of the agenda, it is expected that the quantity or quality of the fissionable material required and the power level of operation will be relatively low for a research and development reactor of the types listed. Stocks of weapon materials will not be significantly increased and may be slightly reduced by the operation of these reactors. In supplying materials for such reactors, an international atomic energy agency will need to take measures to insure that the materials are not diverted for unauthorized purposes. For some of these reactors, especially those listed under 1a and 1b, the agency may find that periodic inspections are sufficient. In other cases, especially under 1c, the agency may wish to have resident inspectors at the reactors. The preparation of fuel elements and processing of irradiated fuel can be carried out either by the agency or under close supervision of the agency, with each facility probably servicing a number of reactors. The agency will need to provide for guarding and continuous inspection of such facilities.

The large-scale utilization of atomic power poses more difficult problems of adequate safeguards. For reactors listed under item 2a, of the agenda, where natural uranium or uranium partially enriched in U-235 is used as fuel, plutonium is produced. Fuel would have to be removed from the reactor and

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processed in order to obtain this plutonium. Safeguards to prevent diversion of plutonium will be needed. If the fuel is irradiated for a long time for reasons of convenience and economy, some of the plutonium will be consumed in the reactor. Precautions will have to be taken to insure that thorium or additional U-238 is not surreptitiously placed in the reactor for the production of U-233 or plutonium from excess reactivity.

For reactors listed under item 2b of the agenda, where plutonium, U-233, or uranium highly enriched in U-235 is used as fuel, fissionable material will be consumed and stocks of weapons material will be correspondingly reduced. The fuel will also be radioactively contaminated and would have to be processed before it again became suitable for use in weapons. Safeguards will be needed to prevent diversion of the fuel during all stages of preparation, irradiation, and processing and to prevent surreptitious insertion of fertile materials into the reactor.

For dual-purpose reactors listed under item 2c of the agenda, plutonium or U-233 is produced and safeguards will be needed to prevent diversion of these materials. Whether or not more fissionable material is produced than is consumed will depend on the design and operation of the reactor and the materials used.

It is clear that the international agency, in providing materials for large power reactors, will have to exercise supervision over design, construction, and operation of the reactors and the preparation and processing of fissionable materials. The maximum protection against diversion of materials requires a complete knowledge of the amount, composition, and disposition of every addition to and withdrawal from the reactor and its ancillary facilities. The ability of an inspection system to give such complete information would be limited not only by difficulties in sampling and imprecision of analysis, but also by such possible irregularities as falsification of construction or operating details. Examples are undisclosed access ports or irradiation channels or substitution of materials, such as fertile material, in place of parasitic poisons in control elements or along with various materials of lower than declared neutron absorption. Thorough inspection during construction would minimize the number of such irregularities escaping detection.

Consideration of the fuel stream through a power reactor and ancillary plants for feed preparation and product extraction indicates the following conceivable methods for clandestine diversion of material:

1. If the reactor uses plutonium, U-233, or uranium enriched in U-235 as fuel, diversions might occur during feed preparation, transportation, or storage prior to reactor irradiation.

2. Irradiated fuel or fertile material might be clandestinely removed from the reactor and replaced by unirradiated material.

3. Irradiated fuel or fertile material or separated product might be diverted following a regular discharge from the reactor.

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A full inspection system would be needed to prevent or detect such diversions. This system would include a technical group of chemists, physicists, and engineers, augmented by statisticians, a records control group, and guards and observers. The technical group would operate in parallel with the regular operating crews of reactors and ancillary chemical and metallurgical facilities. They would determine to their satisfaction, by careful inspection and tests of their own, that they understood in detail all of the structural and design features of the complex, and they would continuously monitor all of the operations. Analytical chemists would make independent determinations on all control samples in the complex. Reactor inspectors would be permitted to install, if they deemed necessary, duplicate measuring and recording equipment to ascertain power levels and other operating characteristics and to calibrate installed equipment. Non-technical personnel would observe all mechanical operations and maintain surveillance over the entire installation and would guard fissionable materials in transit. In addition, a small group located at the site or a larger centrally located group would conduct research into improved methods of precise monitoring.

If it is desired to exercise supervision to the extent that any appreciable diversion or attempted diversion is detected, then it is estimated that a group of roughly 15 technical, 3 semi-technical, and 25 non-technical personnel will be required to monitor a large power reactor or a similar number for a chemical reprocessing plant. The problem of control would be less complex to the extent the Agency operated all or any part of the atomic energy facilities in the countries to which the Agency gave assistance. It should be noted, for example, that if the International Agency were responsible for custody and transportation of fissionable materials and operated facilities for preparation and reprocessing of fuel elements and fertile materials, the problem of control would be greatly simplified with a consequent reduction in the numbers of non-productive inspectors.

ENCLOSURE II

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 10, 1955

MEMORANDUM FOR THE Chairman, Military Liaison Committee

SUBJECT: DRAFT POSITION PAPER FOR GUIDANCE OF U. S. PARTICIPANTS IN DISCUSSIONS WITH SOVIETS ON SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY

Plans are being made for discussions in Geneva starting about August 22 on safeguarding peaceful uses of atomic energy. It is expected that a technical delegation from the U.S.S.R., United Kingdom, Canada, and France will participate along with a delegation from the United States headed by Dr. Rabi and including Drs. Davis, Staebler, and English and Mr. John Hall of the Commission staff. The discussions will be limited to five days and will be confined to an agenda suggested by our Government in a note to the Soviets sent several months ago and accepted by the Soviets in early July.

I plan to forward this position paper to Chairman Strauss in Geneva by State Department pouch leaving Friday forenoon, August 12, and I should like to include your comments on this subject for the information of the Chairman, Dr. Libby and the staff members now in Geneva who will participate in the proposed technical discussions with the Soviets.

K. E. Fields
General Manager

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ENCLOSURE III

DEPARTMENT OF DEFENSE
MILITARY LIAISON COMMITTEE
P. O. BOX 1814
WASHINGTON 25, D. C.

11 August 1955

Dear Mr. Fields:

I have your memorandum of 10 August 1955 inclosing a copy of a proposed position paper for the guidance of United States representatives participating in technical discussions of safeguarding under the International Atomic Energy Agency which are scheduled to begin on 22 August 1955. The views of the Department of Defense on the proposed position paper are as follows:

a. The discussions should be limited strictly to the technical aspects of safeguarding operations under the International Atomic Energy Agency.

b. The "discussion" section of the paper should be transmitted as guidance or instructions rather than information.

c. The Department considers the assumptions to be in accord with national policy, however, for the reasons stated below, assumption 2c should not be construed as requiring that the inspection and control functions of the International Atomic Energy Agency with respect to projects under its cognizance must necessarily be the same for all projects and countries, or the same as would be required in connection with an arms limitation agreement.

The Department understands that one of the principal purposes of the International Atomic Energy Agency is to render assistance to under-developed nations. It is not to be expected that any of the major nations will be on the receiving end of the International Atomic Energy Agency's ministrations but rather that these countries will pursue independently the development of atomic energy for industrial purposes within their own countries. They may use technical information obtained through IAEA channels but are not likely to want materials with strings attached; hence, there will be no international control of their operations to insure against diversions for military purposes. The nuisance and cost features of International Atomic Energy Agency inspection and control, therefore, are to be borne by the under-developed countries whose military potential is relatively insignificant, while the major military powers may "divert" if they so desire.

It appears appropriate for us to discuss what inspection and control would be necessary to insure against diversions and the degree of risk involved in different orders of control. It

should not be implied, however, that the International Atomic Energy Agency would exercise rigid controls, either through inspection or through ownership and operation, in each case in which the Agency has furnished technical assistance and/or materials. To do so would be to defeat the purpose of the organization and to force the under-developed countries into bilateral agreements under which the material control requirements would be established by agreement between the two nations concerned.

These factors point to the absolute necessity, as the Department has consistently maintained, of keeping the problem of "safeguarding under the International Atomic Energy Agency" completely divorced from "safeguarding under arms limitations". Any arms limitation agreement among the major nations will necessarily provide for a comprehensive system of inspection involving all potentially dangerous installations. It might become necessary ultimately to extend such a system to certain of the under-developed countries which were receiving assistance and materials through the International Atomic Energy Agency. In the absence of such a system applied to the major military powers, however, there is no point in penalizing the minor countries by the addition of this burden.

Sincerely yours,

/s/

HERBERT B. LOPER
Chairman

Mr. K. E. Fields
General Manager
U. S. Atomic Energy Commission

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ENCLOSURE IV

UNITE STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 11, 1955

MEMORANDUM FOR MR. K. E. FIELDS, GENERAL MANAGER

SUBJECT: Technical Conference on Safeguarding Peaceful Uses of Atomic Energy

At Mr. Murray's request I have reviewed the position paper and the paper on policy questions provided me by Mr. Foster yesterday, and relating to the subject conference.

From several previous discussions with Mr. Murray, I know it to be his view that, at least for the present, we should not place large amounts of fissionable material at the disposal of the International Atomic Energy Agency. Therefore, he would not approve the assumption of the affirmative answer, which is proposed, to the following policy question:

> "Does the United States contemplated that large amounts of fissionable material for such /large atomic power/ reactors will be provided to the international agency."

In recent Commission meetings, Mr. Murray has urged that approval be obtained to place power reactors abroad. However, he believes that this could be accomplished under bilateral agreements.

/s/ J. W. Crawford

J. W. Crawford

ENCLOSURE V

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 5, 1955

MEMORANDUM

TO : Dr. Paul C. Fine
Division of Military Application

FROM : C. D. W. Thornton, Chief
Office of Operations Analysis

SUBJECT: AGENDA FOR DISCUSSION OF SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY

SYMBOL : OA:CDWT:M-506

Your schedule does not permit detailed setting down of limitations which should be imposed on our negotiators. We shall have to depend, therefore, largely upon the judgment of the technical advisors. I have, however, in the later paragraphs below, noted a few typical areas of the sort I feel our technical people should avoid so as not to inadvertently disclose significant production technology.

We have already discussed the very important policy questions regarding relationships which exist between these conference discussions and Commission actions either already undertaken or currently anticipated. In addition to the suggestions of Commissioner Murray that 1,000,000 kilowatts of electiic power be set as a foreign power reactor goal to be sponsored in the next few years by the U.S.A., there has been information sent to Mr. Strauss (by General Fields) in answer to questions from him. This information was prepared by the Division of Reactor Development (Mr. Davis to Fields, May 26, 1955, Subj: Proposed Foreign Reactor Program) and dealt with the U.S. export of 450,000 kilowatts of nuclear electric power reactor capacity by 1957.

Although such programs involving the rapid launching of a very significant foreign power effort have not been acted upon, the climate is such that it is highly appropriate to rather pointedly discuss what manner of controls over such militarily dangerous facilities should be included in the bilateral arrangements to be worked out, and, as you observed, to have the Commission decide whether we should invite the Russians to play a role in the establishment of controls over such dangerous facilities which we now can unilaterally control and which we are apparently shortly going to permit in friendly nations.

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The agenda itself, which has already been adopted and in which I originally concurred, still appears to me to provide Russian experts with many avenues to obtain information concerning the status of our programs under the guise of discussing safeguards. Such tactics might plausibly take the form of the request that hypothetical, concrete cases be established as the basis for discussion of control problems. For example, any detailed discussions of plutonium or U-233 fueled reactor systems may be undesirable from our point of view particularly if they require developing typical flow sheets upon which to predicate discussions. Disclosure of our relative competence and degree of interest in these materials is the real danger.

The original question of the Russians dealt with whether peaceful applications wouldn't increase the world's supply of dangerous materials. The complete absence of reactor-produced tritium from the agenda may be interpreted so as to put us in an unsatisfactory light for having supplied an incomplete agenda as regards all possible dangerous materials production.

It appears to me as though it would be wise for our negotiators to tend to discuss item 1 of the agenda first and in considerably more detail than item 2. The latter appears most hazardous as regards inadvertent disclosure of production reactor operation details, particularly by personnel generally familiar with reactors but whose interest with friendly nations has been primarily encouragement of power reactor development. It is still premature within the framework of these conferences to discuss details of any power reactors which have present-day materials production technology implications. Such power reactors will not be on stream for some time. For example, assumptions made in such discussions regarding the burn-ups attainable in power reactors and the isotopic makeup of their by-products appear to be areas which should remain quite vague.

There may be some attempts to discuss whether more fissionable material is produced than is consumed in certain reactor types. This type of approach should not be permitted to lead to any discussion of the relative military values of such materials. Only the relative fuel values in a power reactor economy may be discussed and the agenda backup should make this point clear.

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ENCLOSURE VI

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 5, 1955

MEMORANDUM

TO : K. E. Fields
General Manager

FROM : C. D. W. Thornton, Chief
Office of Operations Analysis

SUBJECT: NECESSITY TO CONSIDER CONTROLS OVER POWER REACTORS

SYMBOL : OA:CDWT M-505

Discussions on safeguarding peaceful uses of atomic energy make apparent that the question of the types of controls which may be desirable or required must always be considered when any of our negotiators discuss bilaterals or other agreements for any other than research type reactors. In particular, if Mr. Murray's 1,000,000 kilowatts of foreign power reactors were undertaken, any discussions preliminary to agreements should deal with the provisions for controls over both the fuel itself and also over the few hundreds of kilograms of plutonium a year which might be incidentally produced in such a program. Homogeneous reactors will pose particularly difficult problems.

It appears to me as though this aspect of the transition from research reactor bilaterals to a vigorous foreign power program has received little consideration except quite independently in disarmament contexts. The Reactor Division people nor our bilateral negotiators have little familiarity with the problems since they either have never operated large reactors like our production reactors or are not competent or interested in the measurements and controls aspects of the business (the "nuisance" characteristics).

It should also be observed again that heavy water (which can be a basic thermo-nuclear material) may increase the potential military hazard associated with foreign power reactors. Suitable constraints should therefore be incorporated in the agreements involving transfer of tonnage quantities of heavy water.

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ENCLOSURE VII

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON 25, D. C.

August 9, 1955

MEMORANDUM

TO : Dr. S. G. English
Division of Research

FROM : C. D. W. Thornton, Chief
Office of Operations Analysis

SUBJECT: SPECIFIC CONSTRAINTS FOR BRIEFING U.S.A. PARTICIPANTS PRIOR TO DISCUSSIONS ON SAFEGUARDING PEACEFUL USES OF ATOMIC ENERGY

SYMBOL : OA:CDWT M-507

I am suggesting ideas below which should be used in instructing negotiators in subject conferences. The following constraints should prove to be unnecessary because no such detailed discussions should develop unless the negotiators of the U.S.S.R. initiate them by specific disclosures, apparently based on their own operations and plans. Fairly concrete and quantitative discussions may, however, be undertaken in later meetings based on the same agenda. If possible, the current discussions should be kept general and purposely vague as regards the subject matter listed below:

(1) Discussions of exposure level for heterogeneous reactors should not involve assumptions of irradiation of fuels below the levels assumed specifically in papers presented by U.S.A. authors at Geneva. For natural uranium, an exposure level of 5000 MWD/ton would be a satisfactory assumption for discussion.

(2) No detailed assumptions other than so-called "Geneva assumptions" should be made concerning the throughput of separations plants in relation to reactor complexes which may be made up of heterogeneous thermal reactors (labelled power reactors for purposes of discussion but very similar to our production reactors).

(3) No discussion of isotopic concentrations in reactor generated plutonium or U-233 which might disclose significant AEC operating problems or details nor end-use problems for such materials.

(4) No comments should be made disclosing the relative interest of the U.S. in one or another of various dangerous materials even under the guise of power reactor discussions. Such statements might have intelligence

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significance as regards U.S.A. thorium vs. uranium ore procurement, our interest in U-233, lithium, tritium, etc. particularly since present capabilities of AEC plants might be involved in meeting future multiple objectives involving the integration of peacetime applications with military uses.

(5) No discussion of the mechanics of producing other possible power reactor products such as tritium, particularly as regards the metallurgical matrix in which such material might be produced, the separations techniques for such products, or the possible use of such materials in peacetime thermonuclear or other devices of the sort being discussed on an unclassied basis at the Geneva conference by other nationals.

(5) If declassified prices such as were announced at Geneva in press releases and by U.S.A. authors are used in order to develop the relative importance of technical problems involving different fissionable materials or reactor complexes, great care should be exercised that only consistent ranges of fuel values for various reactor fuels be discussed. No specific assumption should be made which is relatable to production cost of U-235 with its implicit significance in improving capability to calculate U.S.A. production of this material.

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