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NOTE BY THE SECRETARIES

to the

JOINT CHIEFS OF STAFF

on

BACKGROUND PAPERS FOR THE DECLARATION ON DISARMAMENT (U)

1. The attached memorandum by the Acting Director for Disarmament, Office of the Assistant Secretary of Defense (ISA), I-17789/61, dated 24 November 1961, subject as above, is referred to the Special Assistant for Arms Control for comment and recommendation.

2. A reply is desired by 27 December 1961.

F. J. BLOUIN

M. J. INGELIDO

Joint Secretariat

WASHINGTON 25, D.C.
INTERNATIONAL SECURITY AFFAIRS

In reply refer to I-17789/61

24 November 1961

MEMORANDUM FOR THE SECRETARY, JOINT CHIEFS OF STAFF

Subject: Background Papers for the Declaration on Disarmament

The attached Background Papers;* numbers 3, 13, and 14, are forwarded in accordance with letter of September 30, 1961, subject as above, from the Assistant Secretary of Defense (ISA) to the Chairman, Joint Chiefs of Staff. Additional copies have been sent to the Special Assistant for Arms Control, JCS.

Request that eight (8) copies of comments on each of the above papers be forwarded to OSD upon completion.

/s/ JOHN P. McCLEARY
Lt.Colonel, USAF
Directorate for Disarmament

3 Attachments*
As stated above

* Not reproduced herewith; on file in Joint Secretariat

BACKGROUND PAPER NO. 13

CUTOFF OF THE PRODUCTION OF FISSIONABLE MATERIALS AND REDUCTION OF NUCLEAR STOCKPILES

1. Proposals

This paper will discuss the following proposals included in the U.S. Program for General and Complete Disarmament in a Peaceful World.

Stage I

C.(a) "States that have not acceded to a treaty effectively prohibiting the testing of nuclear weapons shall do so."

C.(b) "The production of fissionable materials for use in weapons shall be stopped."

C.(c) "Upon the cessation of production of fissionable materials for use in weapons, agreed initial quantities of fissionable materials from past production shall be transferred to non-weapons purposes."

C.(f) "A Nuclear Experts Commission consisting of representatives of the nuclear states shall be established within the IDO for the purpose of examining and reporting on the feasibility and means for accomplishing the verified reduction and eventual elimination of nuclear weapons stockpiles."

Stage II

C. "Stocks of nuclear weapons shall be progressively reduced to the minimum levels which can be agreed upon as a result of the findings of the Nuclear Experts Commission; the resulting excess of fissionable material shall be transferred to

peaceful purposes."

Stage III

(a) "States would retain only those forces, non-nuclear armaments, and establishments required for the purpose of maintaining internal order; they would also support and provide agreed manpower for a U.N. Peace Force."

(c) "The manufacture of armaments would be prohibited except for those of agreed types and quantities to be used by the U.N. Peace Force and those required to maintain internal order. All other armaments would be destroyed or converted to peaceful purposes.

2. Background

A. United States

(The history of the nuclear test ban negotiations will not be discussed in this review. A comprehensive survey is contained in "Geneva Conference on the Discontinuance of Nuclear Weapon Tests: History and Analysis of the Negotiations", Dept. of State (1961).)

In the Baruch Plan of June 14, 1946, the US proposed the cessation of nuclear weapons production and the disposition of existing bombs after an adequate control system was in operation. It also proposed the establishment of an International Atomic Development Authority which would have "managerial control or ownership of all atomic energy activities potentially dangerous to world security." The Soviet Union countered with a proposal for a convention prohibiting production and use of atomic

weapons, and destruction of all stockpiles "within three months."

The basic principles of the Baruch Plan were approved by the United Nations Atomic Energy Commission on December 31, 1946. The discussion until January, 1950, when the USSR withdrew from the UN Atomic Energy Commission, centered around the timing of inspection and control measures and the character of the control system. The Soviet Union pressed for "simultaneous" institution of prohibitions on nuclear weapons and of international control of atomic energy, while the West argued for the introduction of international ownership of atomic energy facilities and the installation of a control system prior to the elimination of existing weapons.

On December 8, 1953, President Eisenhower, in his "atoms for peace" speech, proposed that the nuclear powers "make joint contributions from their stockpiles of normal uranium and fissionable materials to an International Atomic Energy Agency." The USSR eventually agreed to participate in the work of the Agency.

After 1951 the US no longer included in its proposal the concept of international ownership of nuclear materials. On June 11, 1954, the US supported an Anglo-French memorandum which proposed cessation of nuclear weapons production after a 50% reduction in conventional forces had been achieved, and an elimination of nuclear stockpiles after the remaining conventional force reductions had been carried out. This was later modified to include a beginning of nuclear stockpile reduction after a 75% reduction in conventional forces had been achieved. On the

same day the Soviet Union submitted a draft convention prohibiting the "use, production, and conservation of atomic, hydrogen, and other weapons of mass destruction" and a one-third reduction of conventional armaments during the year following the entry into force of the convention.

On November 4, 1954, the United Nations General Assembly urged further efforts seeking a convention prohibiting manufacture of nuclear weapons and providing for conversion of stockpiles to peaceful uses.

The Soviet proposal of May 10, 1955, contained in its first stage a reduction of conventional forces and an undertaking not to use nuclear weapons, except for purposes of defense when approved by the Security Council. In the second stage the production of nuclear weapons would be discontinued and further conventional reductions would take place.

Due to a reassessment of the difficulties of verifying a reduction of stockpiles and the absence of any known inspection method to accomplish this goal, the US on September 5, 1955, placed a reservation on its previous disarmament positions. In March, 1956, President Eisenhower proposed a cutoff of production of fissionable materials for weapons purposes and a simultaneous beginning to a reduction of weapons stockpiles.

A Soviet statement of August 27, 1957, said that a production cutoff would be significant only when it was "indissolubly linked to the prohibition of atomic weapons, their elimination from the armaments of States, and the destruction of atomic weapons stockpiles."

A Western working paper of August 29, 1957, proposed, as part of a convention containing reductions of conventional forces and other

measures, that future production of fissionable materials would be used exclusively for non-weapons purposes. It also proposed transfers of fissionable materials in agreed ratios from past production to non-weapons purposes. The US proposed that US-USSR transfers would be in the ratio 53:47. (The US delegation was authorized to accept transfers in the ratio 55:45.)

During 1958, the US proposed a technical study of the nuclear cutoff, including a study of inspection techniques. On May 24, 1958, Premier Khrushchev admitted that it was "no longer possible to establish foolproof control over compliance with an agreement banning nuclear weapons" and that it was "easy to manufacture nuclear weapons secretly."

The Western Plan of March 16, 1960, provided for a production cutoff and at the same time, a transfer of fissionable material to non-weapons use, conditional upon "satisfactory progress in the field of conventional disarmament" and the installation and effective operation of an agreed control system to monitor a cutoff. The Soviet Plan of June 2, 1960, proposed a first stage undertaking by non-nuclear countries to refrain from manufacturing nuclear weapons and joint studies leading to a production cutoff and the destruction of stockpiles. In the second stage manufacture of weapons would cease and stockpiles would be destroyed.

The June 27, 1960 proposal of the US provided for a first-stage cutoff and transfer of fissionable material to non-weapons use conditional upon progress in conventional disarmament. In the second and third stages stockpiles would be further reduced. At the August 16 meeting of the UN Disarmament Commission, the US announced that after production

of fissionable materials for weapons purposes had been stopped, it would be willing to set aside for peaceful purposes 30,000 kg. of weapons-grade U-235 if the Soviet Union would made an equal contribution. The US also proposed an alternative procedure whereby a reciprocal plant-by-plant shutdown of equivalent production facilities would take place.

At the United Nations on September 22, 1960, President Eisenhower proposed that the nuclear powers convene experts to design an inspection system for a cutoff and that a cutoff go into effect as soon as the agreed inspection system is operating, "while progress in other disarmament fields is also being sought." He also proposed the transfer of fissionable material to international stockpiles after the installation of the cutoff. On September 23 the Soviet Union introduced the basic provisions of a treaty on "general and complete disarmament." This repeated the proposals of June 2.

B. Allies

According to intelligence estimates, France, while favoring controlled disarmament in principle, has as its primary objective the establishment of France as a full member of the nuclear club. The basic French position has been, and will probably continue to be, that controls cannot be applied to nuclear weapons without simultaneous control of delivery systems and significant reduction of stockpiles of both weapons and vehicles.

The United Kingdom is interested in inhibiting the develoomeent of additional nuclear powers, and has consistently supported the production cutoff as well as the reduction of nuclear stockpiles.

The U.K. favors a link between the nuclear cutoff and conventional disarmament, but has acquiesced in the US position. It may refer to an understanding included in the Stassen-Noble letters of 1957. In these letters the US implied that it would assist the UK in fulfilling its nuclear materials requirements in the event of a cutoff. The present US position is that this understanding applied only to the conditions of 1957 and is not applicable today.

West Germany will probably oppose any measures which permanently foreclose the possibility of its obtaining nuclear weapons, unless at the same time the nuclear capabilities of other powers are brought under control.

Canada is very much interested in controlling and reducing the nuclear threat, and favors these measures.

C. Communist Bloc

The Soviet Union has repeatedly expressed concern about the consequences of a nuclear war, and has advocated a complete ban on nuclear weapons. It has proposed a cutoff of production of nuclear weapons and an elimination of stockpiles as part of a general prohibition of nuclear weapons. However, intelligence estimates suggest that the Soviet Union is not prepared to cease production of fissionable materials at the present time, since it has not yet met its stockpile requirements. It is also reluctant to accept the inspection system accompanying a cut-off. The conditions under which it would undertake reductions of nuclear stockpiles are not known.

The Soviet disarmament proposal of September 23, 1960, includes in its first stage the elimination of all means of delivering nuclear weapons, but reserves for its second stage any reduction in the number of such weapons. The first stage contains a provision for studying their elimination: "In the first stage joint studies will be undertaken of the measures to be implemented in the second stage relating to the discontinuance of the manufacture of nuclear, chemical and biological weapons and to the destruction of stockpiles of such weapons." In the second stage the plan proposes "There will be a complete prohibition of nuclear, chemical, biological and other weapons of mass destruction, with the cessation of manufacture and the destruction of all stockpiles of such weapons." Control will be carried out by the following means: "Representatives of the control organization will conduct the on-site inspection of the destruction of all existing stockpiles of nuclear, chemical and biological weapons. The control organization will have the right to inspect all enterprises which extract raw materials for atomic production or which produce or use fissionable materials or atomic energy. By agreement, permanent control teams may be established at some plants and installations."

China appears determined to obtain a nuclear capability, and may be expected to oppose any measures which would hinder this development. It is expected to explode its first nuclear device during the period 1961-3.

3. Explanation of US Position

Except for the explicit connection between transfers of fissionable materials from past production and the production cutoff, there is no linkage between any ~~of the~~ measures discussed in this paper and any other measures in the U.S. Program.

I.C.(a) "States that have not acceded to a treaty effectively prohibiting the testing of nuclear weapons shall do so."

The United States continues to seek an early agreement on the suspension of nuclear weapons tests under workable controls. Along with the UK, it has proposed a treaty which it is prepared to sign. The US is prepared to resume the Geneva Conference on the Discontinuance of Nuclear Weapon Tests at any time; it may also be willing to discuss the test ban treaty in the context of general and complete disarmament. Measure I.C.(a) provides that all other parties shall accede to the treaty ~~which~~ which is agreed upon.

I.C.(b) "The production of fissionable materials for use in weapons shall be stopped."

This measure envisions a cutoff in the production of fissionable materials (U-235, Pu-239, U-233) intended for use in weapons. Production of fissionable material for military propulsion and for civilian uses would be permitted. The production of tritium, which is non-fissionable but which is produced in the same type of reactors which can produce fissionable materials, would be permitted, as would the production of U-235 to fuel a tritium-producing reactor. However, no mention of tritium should be made during initial presentations of the US position;

discussion of tritium should be delayed until it has been determined that serious negotiation of the cutoff will take place.

The cutoff would include the shutdown or monitored operation of all nuclear reactors which produce Pu-239, and of diffusion plants which produce high-enrichment U-235. The US should propose that inspectors be trained and the inspection system ready to operate prior to the shutdown of facilities. The proposed inspection system, in which declared facilities are monitored and a search for clandestine facilities is conducted, is described in an unclassified Appendix. This inspection system is practical, permits only small amounts of diversion relative to existing stockpiles, and requires only a moderate amount of men and money. On the other hand, it requires rather free access to declared facilities and to suspected areas.

The cutoff to be proposed requires the shutdown of all facilities producing fissionable materials solely for weapons purposes, with remaining production being carefully monitored. It might be possible to continue production at the current rate, while insuring through detailed inspection that all fissionable material is accounted for and not diverted to weapons use. This alternative has been rejected because of the large diversions which would be possible and the high inspection costs that would result.

Conversely, a complete shut-down of all production facilities might have some advantages. The inspection of these facilities would be very much simpler, although inspection for clandestine facilities would

still be required. This alternative has the disadvantage that it would not permit the production of tritium, while cannibalizing the stockpile to obtain material for peaceful purposes would either hamper the development of atomic energy for civilian purposes or eventually drain the weapons stockpile. Nevertheless, the consequences of this should receive serious study, since it does present a possible change in the negotiating position.

Tritium is believed to be absolutely essential to the great majority of the nuclear weapons now possessed by the US, so that no cutoff in the production of tritium can be envisioned without very detailed, high-level consideration. On the other hand, the total amount of tritium in stockpile can be stabilized by permitting its production only in exchange for He-3, its decay product. Since large amounts of He-3 can be obtained from normal helium production and used to deceive this system, such a proposal requires careful study before it can be introduced as a formal proposal.

The production cutoff would freeze the total amount of fissionable material in the weapons stockpile. It is thus a prerequisite for any program aimed at reducing existing nuclear stockpiles. It will prevent the production of nuclear weapons by all those non-nuclear powers which accede to the agreement. This will tend to reduce the danger of accidental, unauthorized, or inadvertent use of nuclear weapons, and will reduce the danger of catalytic nuclear war.

It is believed that the US stockpile of fissionable material is considerably larger than that of the Soviet Union, but this numerical

advantage will diminish in future years. Thus, on purely quantitative grounds, this proposal could be of advantage to the US. This assumes the establishment of an effective inspection system, the exclusion of tritium from the agreement and the absence of restrictions on modernization of the stockpile. Since our military establishment relies more heavily on nuclear weapons and must deploy them in many areas throughout the world, our requirements are greater than are those of the Soviet Union. For this reason, we have often in the past tied a production cutoff to progress in conventional disarmament. This connection is not maintained in this proposal.

I.C.(c) "Upon the cessation of production of fissionable materials for use in weapons, agreed initial quantities of fissionable materials from past production shall be transferred to non-weapons purposes."

II.C. "Stocks of nuclear weapons shall be progressively reduced to the minimum levels which can be agreed upon as a result of the findings of the Nuclear Experts Commission; the resulting excess of fissionable material shall be transferred to peaceful purposes."

III.(a) "States would retain only those forces, non-nuclear armaments, and establishments required for the purpose of maintaining internal order; they would also support and provide agreed manpower for a U.N. Peace Force."

These measures envision a step-by-step reduction in nuclear weapons stockpiles and the transfer of fissionable material from weapons to

peaceful purposes. The US should repeat its proposal of August 16, 1960, that initially 30,000 kg. of weapons-grade U-235 be transferred under international supervision to peaceful purposes by the US and the USSR. Detailed proposals for further quantities of material to be transferred and for the transfer, storage, and verification techniques are not available at the present time. Reductions will have serious effects on US military capabilities, which have not yet received adequate study.

I.C.(f) "A Nuclear Experts Commission consisting of representatives of the nuclear states shall be established within the IDO for the purpose of examining and reporting on the feasibility and means for accomplishing the verified reduction and eventual elimination of nuclear weapons stockpiles."

It should be possible to devise a scheme whereby the fissionable material is transferred to an international organization which can insure that it is not diverted or returned to weapons use. However, the verification of the size of the remaining stockpile, especially during the later stages of disarmament, is at present an unsolved problem. Estimates can be made with sufficient accuracy to permit a modest first-stage reduction, but later reductions can only be determined in the light of the report of the Nuclear Experts Commission.

All nations agree that the problem of verifying the size of existing stockpiles is a very difficult one, and no one has proposed a

workable inspection scheme. Measure I.C.(f) is intended to provide a multilateral means for attacking this problem. As a proposal, it is intended to make the Soviet Union back down from its insistence on blanket "prohibitions" and face up to the difficulties of verifying stockpile elimination.

The US should propose that this Commission be set up immediately, and that it be composed of experts from the nuclear nations.

If the UN Peace Force is to be provided with nuclear weapons, it must obtain these weapons from the nuclear powers. The US is not prepared at the present time to take a position on whether the Peace Force should have nuclear weapons or on how it should obtain them.

4. Documentation and Studies

A study is required of alternative approaches to the cutoff including a graduated cutoff, a cutoff with a built-in time limit, and a cutoff with limited inspection. A detailed inspection system must also be prepared.

A study is urgently required of

(a) possible quantities of fissionable material which might be transferred from stockpiles in each stage,

(b) methods of implementing this transfer and assuring that the material is used for peaceful purposes, and

(c) methods of verifying remaining stockpiles.

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2. AEC Position Paper on Soviet Proposal for Prohibition and Elimination of Nuclear Weapons. Disarmament Document Series Memo No. 38. October 17, 1958. OFFICIAL USE ONLY

Gives reasons why elimination of nuclear weapons is not an attainable goal, and discusses history of negotiations.

3. Cutoff of Future Nuclear Production. Disarmament Document Series No. 98. February 2, 1960. OFFICIAL USE ONLY

4. Review of Positions Taken by the United States in Regard to the Prohibition of the Production and Use of Nuclear Weapons, 1945-1960. Research Project No. 1, USDA.

5. Ten Nation Disarmament Committee Verbatim Records Her Majesty's Stationery Office, London. September, 1960.

The following are some especially pertinent excerpts:

Page	Speaker
Nuclear Cutoff & Transfer	
127-9	Moch
250	Ormsby-Gore
259-262	Zorin
353	Zorin
363-6	Eaton
429-431	Eaton
487-490	Zorin
Use of Nuclear Weapons	
414-7	Mezincescu
431-3	Zorin
487-8	Zorin

6. The Report of the Panel on the Cutoff of the Production of Fissionable Materials for Weapons. Perkins Panel. USDA. April, 1961. TOP SECRET RESTRICTED DATA

Discusses the military implications of a cutoff. Proposes an inspection system for both declared and clandestine facilities. Discusses Nth country effects. Annexes give detailed inspection system.

7. Final Report of the Consultative Group on Nuclear Armaments. Brooks Panel, USDA. May 16, 1961. SECRET RESTRICTED DATA

Reviews proposed nuclear disarmament measures.

8. US AEC and General Electric Co. Hanford Atomic Products Operation, Richland, Washington, Control and Inspection Systems for Plutonium Production (HW-62119) C.A. Bennett, J.W. Healy, W.R. Lewis, and J.B. Work, 1959. OFFICIAL USE ONLY

9. US AEC and General Electric Co. Hanford Atomic Products Operation, Richland, Washington, Studies of Inspection and Control Systems - No. II (HW-68000) R.J. Broune, 1960. SECRET RESTRICTED DATA. Sigma 2.

Technical methods for detection of specific nuclear processes, inspection and control methods for locating hidden nuclear facilities and their implementation.

10. US AEC and Union Carbide Nuclear Co. K-25 Plant, Oak Ridge, Tennessee. Material Control and Inspection at a Caseous Diffusion Plant (KOA-611). A. de la Garza and C.R. Milone, 1959. OFFICIAL USE ONLY

11. US AEC and Union Carbide Nuclear Co. K-25 Plant, Oak Ridge, Tennessee. International Monitoring of a Very Highly Enriched Uranium Facility (Y-1305). F.S. Patton et al., 1960. OFFICIAL USE ONLY

12. US AEC and Union Carbide Nuclear Co., Assessment of a Control System (ORLN-3121) A.E. Cameron, 1961. SECRET RESTRICTED DATA

13. JCSM-487-61 Memorandum for the Secretary Net Military Consequences of the Cutoff Production of Fissionable Material dated July 21, 1961.

APPENDIX

INSPECTION OF A CUTOFF OF PRODUCTION OF FISSIONABLE MATERIALS FOR USE IN WEAPONS

I. Purpose

The purpose of this appendix is to describe the inspection system of a cutoff of production of fissionable materials for use in weapons. It is unclassified; some classified explanatory notes follow.

II. Assumptions

This system assumes that the cutoff would permit continuance of U-235 production to the extent needed to provide fuel to maintain weapon stockpiles, for non-weapons military purposes, for civilian power, and for research and test reactor operation. Associated fuel preparation and chemical reprocessing facilities would be permitted to continue in operation. The production facilities postulated to be in operation under a cutoff agreement are those necessary to produce only enough fissionable material to supply allowed uses.

III. Objective of Inspection

The objective of inspection is to ensure that fissionable materials are not produced for, nor diverted to, use in weapons.

IV. Description of Inspection

A. Declared Plants

1. Operating Plants

a. General Provisions

Operating reactors, gaseous diffusion plants, and processing facilities would be subject to continuous inspection. The inspectorate would be granted physical access to the facility being inspected; to materials used, processed, or produced; and to pertinent records and data. The major rights which the inspectorate

would need for inspection of operating plants are given in Section IV. C.

The inspectorate would attempt to verify, by independent measuring and sampling, the accountability of fissionable material, and to provide the physical surveillance and security measures necessary to verify that no diversions are taking place. Material would be accounted by:

1. Taking periodic inventories throughout the entire system.
2. Measuring and recording process flow.
3. Consolidating data obtained from inventory and process flow measurements.

b. Plutonium Production Facilities (Reactors)

Material control is most effective accomplished at key points in the production process where special attention is ordinarily given to the fissionable material. In plutonium production, for example:

1. The feed materials are closely controlled because of critical mass considerations.
2. The discharged fuel elements require careful handling because they contain large quantities of radioactive fission products.
3. Critical mass hazards and the value of the produce require careful control of the separation process, involving especially measurement of the starting solution.

The inspection team would measure all declared materials received by the fuel preparation area and all declared outgoing shipments. The fuel elements would be checked on receipt for conformity to the fuels preparation records. They could then be placed in locked storage under control of the inspection team. A monthly inventory would be taken. The team would also follow the production process. The inspectors would be notified of all shipments in and out, and these would be held for inspection until released by the inspectors. Spot checks at other times will permit the team to assess the validity of such notifications.

There are numerous cross-checks that might be made with regard to the amounts of materials or passing through any point in the system. Examples are:

1. Reactor heat output and neutron flux.
2. Fission product measurements.
3. Isotopic compositions of uranium and plutonium in the product from the system.
4. Radiation level of discharged materials.
5. Other physical measurements on inputs and outputs.

6. Cross-checks of other materials (coal, electricity, fuel element cans) involved in the production process.

The arrival time, origin, and content of all irradiated fuel shipments to the chemical separation plant would be reported in advance to the inspection team. The team would have the right to monitor the rail and road accesses to the chemical separation plant without advance warning, and could intercept and inspect incoming irradiated fuel shipments. Facilities would be provided for such inspections.

Some form of perimeter inspection may have application to such facilities as military propulsion reactors where it may be agreed not to reveal classified technology nor to permit intrusion into the military establishment.

c. Gaseous Diffusion Facilities

In a gaseous diffusion plant, material control is achieved by inventory of the production cascade and by surveillance and/or restriction of inputs to nearly equal outputs. Continuous perimeter control would be maintained by the inspectorate, power input would be measured, and amounts and compositions of feed material would be measured. The cascade storage facilities, in which inputs and outputs to and from the cascade are stored, would be controlled by measuring inputs to the storage facilities, surveillance of these facilities,

and physical inventorying of the containers. Feed manufacturing, in which the raw material is converted to uranium hexafluoride, would be controlled by measuring inputs and outputs. The operation of the cascade would be controlled by demonstrating a material balance within measurements uncertainties. Equipment decontamination must be monitored by physical security methods.

2. Non-Operating Plants

The inspection of a non-operating declared facility should be comparatively simple and foolproof. The inspection objective is to insure that only permitted facilities are operating for agreed purposes. Periodic internal visits or continuous external inspection should suffice to assure that the facility has not been used or tampered with.

B. Undeclared Plants

It will be necessary to identify suspicious sites or general areas where undeclared fissionable material production sites may exist. An important requirement of an inspection system is that it be able to examine these sites and suspect areas. An inspection system which includes the following steps seems most advisable:

1. Decision to conduct an on-site inspection.

This decision may result from:

a. Evidence obtained by the inspectorate which fulfills agreed criteria concerning suspicious activities or events.

b. Quota right. Any party to the agreement may require that an inspection trip be made without presentation of evidence. The quota for such inspections would be fixed by agreement.

2. Confirmation or refutation of initial suspicion.

The second step involves an area survey. The inspectors would have the right to make aerial photographs, to obtain aerial samples, and to use air-borne detection and measurement instruments. They would be permitted to inspect a complete perimeter around a suspect facility within the photographed area. The perimeter should not be more than 5 miles distant from the suspect plant at any point. The team should have agreed rights, such as the right to take photographs, observe incoming and outgoing shipments, and to measure electric power and other utilities supplied to the inside of the perimeter. The inspection team should be granted this access for a continuous period up to a month in duration.

After the completion of step 2, it may be determined that no need exists for further access. If suspicions are still not allayed, evidence obtained

in step 2, as well as any other available evidence, would provide the basis for determination (e.g., by a control organization) whether step 3 would be permitted.

3. Obtaining incontestable proof of a violation if one has occurred.

Step 3 involves direct inspection of the interior of suspect buildings or structures within the previously inspected perimeter. The degree of access can be limited to cursory inspection of each large room within the suspect facilities. Equipment which may be sensitive for other reasons may be hidden under drop cloths.

C. Rights and Agreements Needed for Inspection of Operating Declared Facilities

Some of the major specific rights and authorities the inspectorate would need to operate this inspection system are the following:

1. Complete physical access to all fissionable material production areas, limited only by radiation hazards and safety of plant operation.
2. Access to a set of "as built" prints for the plant, supplemented by the design descriptions and performance specifications for critical equipment. This would also require an up-dating of these prints as plant changes are made.

3. Receipt of a complete description of the process, including "normal" or expected performance of each step; advance copies of all production schedules, plus specified log sheets to verify actual production data; prior warning of planned changes in operations or schedules; and after-the-fact explanation of deviations from planned procedures or schedules.
4. An agreement that plant accounting records on source and special nuclear materials be kept in auditable fashion and that interplant shipments and shipments between selected material balance areas may be observed, audited, or handled by the inspectorate.
5. An agreement by the plant to demonstrate an initial and a monthly inventory within the practical limits of the process.
6. An agreement to install equipment such as reactor heat measuring devices and dissolved uranium measuring and sampling devices, and to calibrate plant equipment necessary to verify the plant inventory.
7. An agreement to install fences or other barriers around key centers (such as discharge faces of reactors, dissolver charging areas, fabrication areas amd storage facilities) and to maintain inspectorate control of access.

8. An agreement as to what plant data other than those mentioned above shall be available to the inspectorate, including a policy on whether plan personnel may obtain data collected by the agency.

9. An agreement concerning reasonably prompt recovery of fissionable material residues, including those inside plant equipment, and an agreement that changes in plant operation or in plant design not be carried out until there is reasonable assurance of their effect on established rates of the accumulation of such residues.

10. A specified mechanism for arbitration of disputes or conflicts of programs.

EXPLANATORY NOTES

1. Manpower Requirements and Inspection Capability

No system of inspection can establish the complete absence of unauthorized diversions. There is some margin of uncertainty in all inspection systems, no matter how carefully devised and conscientiously carried out. Substantial inspection with full access should be capable of yielding information permitting reasonable judgment on whether diversions greater than one per cent of the monitored fissionable material throughput had occurred over an extended period of time (one year or more).

The amounts of tritium that can be diverted without detection depends in greater degree on the specifics of reactor and separation plan operation than is the case for plutonium. For a routine well-run operation the divertable amount may be as little as that equivalent to the estimated plutonium diversion, but erratic operation, deliberate or otherwise, can permit more diversion without detection.

In order to estimate the costs and manpower requirements of inspection it is necessary to postulate the size and operating status of the plants subject to inspection. As examples, we estimate the following manpower requirements, including inspectors, technicians, and administrative personnel, for providing full-time inspection of various types of plants:

Feed and Fuel Preparation

Low enrichment uranium 8-12

High Enrichment uranium	10-14
Plutonoum	8-12
Reactors	
Production reactor	5-10
Civilian group (five civilian reactors in the same geographical region)	7-11
Test and experimental group (one or two reactors at a given site)	5-10
Irradiated fuels processing plants	
Plutonium	9-14
Tritium	9-14
Large gaseous diffusion plant	175

In addition a staff of about 50 will be required in a country the size of the US to conduct inspections for clandestine facilities. This staff might have to be considerably enlarged if small production facilities become significant, as would be the case if large weapon stockpile reduction took place.

Such a system is estimated to be capable of detecting a diversion of 5% to 10% of plant throughput over an extended period of time (1 year). It will require approximately 300 people for both the United States and the Soviet Union.

2. Materials Involved

The basic fissionable materials employed in weapons are plutonium and enriched uranium-235. Tritium, while not a fissionable material, is used in some weapons and must be considered under a cutoff since it is

produced in plutonium production facilities (reactors). Tritium in stockpile introduces special problems because it decays radioactively at 5½% per year.

3. Methods of Production

Uranium ore is the sole source of all fissionable material and tritium production. Ore is recovered by mining and concentrated by milling. Concentrates thus obtained are futher processed in feed materials facilities for purification and conversion of the uranium to the form used in fissionable material production. Plutonium and tritium are produced in nuclear reactors, and are subsequently separated from other materials and purified in a chemical separation plant. Enriched U-235 is produced in gaseous diffusion plants. Numerous auxiliary operations are involved in these production systems.

Plutonium and tritium are produced when the non-fissionable raw material (uranium-238 and lithium-6, respectively) is bombarded by neutrons. These are produced during the fission of uranium-235 within a reactor.

4. Non-Weapons Applications

The primary non-weapons application of atomic energy is the nuclear reactor; various types are employed for electric power generation, naval propulsion, and research. Each reactor consumes fissionable material, primarily U-235, in its operation; it may also produce plutonium (or tritium) as a by-product. There are substantial and continuing requirements for fissionable material for non-weapons

application and for the potential role of nuclear power in the civilian economy. It is contemplated that these requirements will be met by continual, but limited, production operations under inspection to guard against diversion of materials to weapons use.

5. Stockpile Maintenance

To avoid erosion of stockpile effectiveness by tritium decay, limited tritium production is assumed to be permitted and undertaken under inspection. Turnover of Helium-3, the decay product of tritium, to the inspection agency in exchange for an equivalent amount of tritium would impose some control on the total amount of tritium in stockpile.

6. Types of Reactors

Production: Nuclear reactors designed to optimize production of plutonium or other reactor products and not capable of producing significant electrical power.

Dual Purpose: Nuclear reactors designed to optimize production of plutonium or other reactor products and to produce electrical power as a by-product.

Civilian Power: Nuclear reactors designated to optimize the production of electric power. These reactors in general will produce plutonium at a rate about one-half or more that of a production reactor of the same total thermal power.

Military Power: Reactors designed for propulsion or for rather small-scale mobile or stationary electrical power. In general, these

reactors are loaded with fully-enriched uranium-235 and thus do not produce reactor products. Operation for some production (e.g., tritium) would be entirely feasible.

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Series A.

BACKGROUND PAPER NO. 14

APPLICATION OF IAEA SAFEGUARDS TO TRANSFER
OF FISSIONABLE MATERIAL FOR PEACEFUL PURPOSES

1. Proposal

This paper will discuss the following proposal contained in the U.S. Program for General and Complete Disarmament in a Peaceful World:

I.C.(d) "Any fissionable materials transferred between countries for peaceful uses of nuclear energy shall be subject to appropriate safeguards to be developed in agreement with the IAEA."

2. Background

A. United States

This measure has not previously been included in a disarmament proposal.

President Eisenhower proposed the formation of the IAEA in his UN speech of December 8, 1953. He proposed that this agency would receive contributions of fissionable material from the nuclear powers and would distribute this material under agreed safeguards. In a statement delivered on December 21, 1953, the Soviet Union opposed this proposal because it was not coupled with a ban on nuclear weapons.

The question of IAEA safeguards has been debated for the past four years. At the time that the creation of the IAEA was being discussed, and it was proposed that it would be a source of fissionable materials for peaceful uses, concern was expressed that the transferred fissionable

materials would be used for weapons purposes. The safeguards were established to meet this concern. The IAEA Board of Governors approved an initial set of principles and procedures for safeguards on January 31, 1961, by a vote of 17-6, with USSR, Poland, Bulgaria, Iraq, Ceylon, and India opposed.

These safeguards apply to small research and test reactors, research and development facilities and the associated nuclear materials. Consideration of procedures for larger facilities, fuel fabrication and reprocessing plants, and large quantities of material has not been undertaken.

The opposition to the safeguards document was spearheaded by the Indians, who received background support from the USSR. The Indians opposed the measure as an infringement of national sovereignty and a form of discrimination against the non-nuclear powers. Thus far the USSR has done nothing to nullify the safeguards principles, but they have been generally uncooperative in their development.

B. Allies

All the nuclear powers have their own safeguarded bilateral arrangements. Both the U.S. and Canada have announced, jointly with certain of their bilateral partners, that they expect to transfer these arrangements to IAEA administration, and negotiations with Japan to this end are under way at present; however, it is not clear how widespread will be the support for IAEA safeguards administration. The more recent U.S. bilateral agreements contain provision for transfer, upon mutual consent,

to IAEA supervision.

C. Communist Bloc

The Soviet Union has generally opposed the safeguard measures of the IAEA, and may be expected to oppose this measure. A Soviet aide memoire of March 3, 1960, took the line that safeguards would be meaningless without cessation of nuclear tests and the destruction of weapons stockpiles.

The Chinese will probably oppose any measure which restricts their freedom to obtain nuclear weapons.

3. Explanation

This measure is not linked to, or required by, any other measures in the program. It is intended to insure that fissionable material transferred between countries for peaceful purposes is not diverted to weapons uses. The IAEA is an existing organization, so that development of additional safeguards procedures and the negotiation of detailed agreements implementing this first step in the international control of nuclear energy can be begun immediately. This measure will greatly enhance the exploitation of nuclear energy for peaceful purposes and provide an essential element in the control of nuclear weapons.

The IAEA has established a system of safeguards to ensure that fissionable material distributed by it will be used only for peaceful purposes. A period of 2½ years was required for the negotiation of these safeguards. The presently approved procedures cover only the quantities of material expected to be distributed by IAEA during the next two years.

This material will be obtained from individual countries, principally the United States. The U.S. has offered to permit the IAEA to use four of its reactor facilities to test the IAEA safeguards system; successful conclusion of current negotiations will allow these tests to begin in late 1961. Also during this period (1961-3) the first transfers of fissionable material under IAEA auspices will take place (Norway and Finland will receive material supplied by the United States). The first inspections under the IAEA safeguards system will take place shortly after the transfers to user nations take place.

IAEA safeguards are attached to nuclear material supplied by the Agency whenever the total amount of material in a recipient State exceeds a certain minimum, and to nuclear material produced using materials to which Agency safeguards are attached. Safeguards are also attached to facilities supplied or substantially assisted by the Agency. The IAEA examines and approves designs to assure that they will not further any military purpose and that they will permit effective application of Agency safeguards. The IAEA also will conduct inspections to account for material and detect diversions. Specific criteria for reporting and for the conduct of inspections have been established for reactors below 100 thermal megawatts.

All the nuclear powers now have bilateral agreements governing the use of fissionable material transferred between countries.

U.S. Safeguards Program

The U.S. has bilateral agreements with all countries to which it loans, leases, or sells nuclear material. The agreements provides that

these countries shall keep adequate records, and shall make periodic reports to the U.S. Atomic Energy Commission on the operation of the facilities and the use of the material. The agreements also permit the AEC to "observe" "from time to time" the condition and use of any received material and to observe the performance of the reactor in which the material is used.

The AEC maintains a safeguards group which receives and evaluates reports on the use of fissionable materials under these agreements, trains inspectors, and conducts on-site inspections in each country. Thus far this group has conducted 180 inspections in 20 countries. U.S. procedures are based on the IAEA safeguards system, where appropriate. When performing an inspection, AEC inspectors are instructed to tour the facility, look for any aspects of a nuclear weapons industry, check operating records, audit material account records and make field tests of fuel usage.

U.S. Proposal

The proposed measure would ensure that all fissionable material transferred between countries would be under adequate safeguards administered by an impartial international organization. Since existing IAEA safeguards do not cover all facilities using nuclear materials, more comprehensive safeguards must be developed in agreement with the IAEA.

The U.S. should propose that the IAEA operate these safeguards. However, this must be decided in consultation with the IAEA and the other states

concerned. The U.S. should note that the IAEA will not operate the inspection system set up to monitor a production cutoff; the IDO, a separate organization, will operate this system. However, because of the close connection between these systems and the similarity of the inspection requirements, the IAEA should work closely with the IDO in establishing the system.

The U.S. should propose that the disarmament conference, in consultation with IAEA, establish a separate forum to develop procedures for applying the new safeguards.

In conjunction with a production cutoff, this measure would provide world-wide supervision of the production and use of fissionable materials. The cutoff would involve the verification and inspection by the IDO of the production of fissionable materials within nuclear powers, and would insure that these materials were not put to weapons use in those countries. This measure would provide international assurance that materials which were transferred between countries for peaceful purposes were not diverted to weapons uses.

4. Documentation and Studies

A. A study is required of the necessary modifications in the IAEA structure and safeguards to implement this measure.

B. Bibliography

1. The Agency's Safeguards, IAEA Document INFCIRC/26, March 30, 1961, approved by the Board of Governors, 1/30/61.

2. Further information on the IAEA may be obtained from S/AE or the AEC.

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