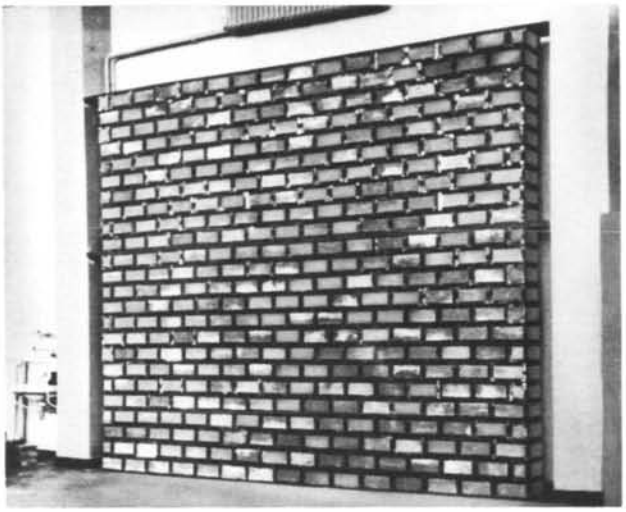


A wall of the reactor room at Vinca where the IAEA's dosimetry project was conducted. The wall is shielded by concrete bricks

The United Kingdom Atomic Energy Authority supplied on loan the $6\frac{1}{2}$ tons of heavy water needed to restart the reactor and a scientist from the Authority performed his own measurements with the experiment.

The United States arranged for the expert team from Oak Ridge to perform the actual measurements with its own specialized equipment and make the necessary calculations. The team was under the direction of Dr. K. Z. Morgan and consisted among others of Dr. G. S. Hurst, Dr. R. H. Ritchie and Dr. A. D. Callihan.

The experiment and measurements were carried out at the end of April 1960.

Individual Doses (All Values are in Rad Units)

Individual	Charged Particle Dose	H(n, γ)D Gamma Dose *	External Gamma Dose	Total
H	66	99	158	323
V	89	133	214	436
G	90	135	189	414
M	87	130	209	426
D	91	136	192	419
B	45	67	95	207

* *Gamma dose resulting from the capture of neutrons by hydrogen in the body.*

ATOMIC SAFEGUARDS

Consideration by General Conference

At its fourth regular session in September of this year, the General Conference of IAEA considered a set of safeguards principles and procedures which had been provisionally approved by the Board of Governors and referred to the Conference "for appropriate action."

After detailed discussion, in which a large number of delegates took part, the Conference adopted by a vote of 43 in favor, 19 against and 2 abstentions, a resolution sponsored by 15 Member States. *

The sponsors had accepted in Committee an amendment moved by Austria, Sweden and Switzerland.

The resolution notes that the Board of Governors had "provisionally approved principles and procedures to provide information and appropriate guidance for Member States as well as for the guidance of the Board itself in the administration of safeguards by the Agency" and that the proposed procedure should guide the Board in negotiating agreements with Member States, "having regard to the principle of non-discrimination between them". The Board was invited, before giving effect to the safeguards principles and procedures, to take into account the views expressed in the General Conference and to report on the application of the safeguards annually to the Conference. A review of the principles and procedures should be presented to the sixth regular session of the General Conference (1962).

The following countries voted for the resolution: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Denmark, El Salvador, Finland, France, Federal Republic of Germany, Greece, Guatemala, Holy See, Honduras, Iceland, Iran, Israel, Italy, Japan, Korea, Mexico, Monaco, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Peru, Philippines, Portugal, Spain, Sweden, Switzerland, Thailand, Turkey, Union of South Africa, United Kingdom, United States of America, Venezuela, Viet-Nam.

* *Australia, Brazil, Canada, Greece, Italy, Japan, Netherlands, Nicaragua, Peru, Philippines, Portugal, Thailand, Turkey, United Kingdom, and United States of America.*

Against were: Afghanistan, Bulgaria, Burma, Byelorussian Soviet Socialist Republic, Ceylon, Cuba, Czechoslovakia, Ghana, Hungary, India, Indonesia, Iraq, Morocco, Poland, Romania, Ukrainian Soviet Socialist Republic, United Arab Republic, Yugoslavia.

Ethiopia and Tunisia abstained.

Brief History

The Statute of the Agency enjoins it to "ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose". The Statute authorizes the Agency to establish and administer safeguards in fulfillment of this objective. It also provides that if requested, the Agency may apply safeguards to a State's own nuclear activities or to a bilateral agreement between two States* or organizations or to a multilateral arrangement between more than two States or organizations.

Since its inception, the Agency has been engaged in the complex task of formulating safeguards procedures that would be both technically adequate and generally acceptable. Draft rules were prepared by the Agency's Secretariat and discussed in detail by its Board of Governors. References to the issue of safeguards were also made during the general debate at the last session of the General Conference.

After considering the subject at a number of meetings the Board of Governors provisionally agreed upon certain general principles for the application of safeguards. A revised draft of detailed procedures based on the principles was presented to the Board during its series of meetings in January 1960. After examining this draft, the Board set up a Special Working Group of Expert Representatives to prepare a consolidated working paper. The group consisted of representatives from Brazil, Czechoslovakia, France, India, the USSR, the UK and the USA, with Professor Gunnar Randers of Norway as chairman. The report of this group was considered by the Board in April, and the document transmitted to the General Conference was based largely on this report.

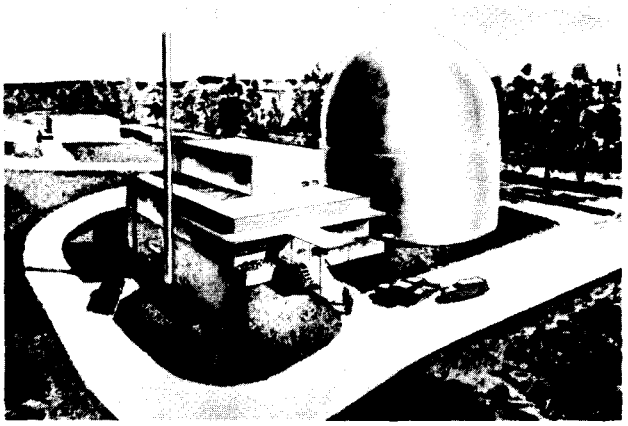
Summary

The main principles and procedures as contained in this document are summarized in the following paragraphs.

The procedures cover requirements anticipated in the immediate future and relate only to reactors

* *In the course of the recent General Conference session several countries announced that they had entered into negotiation with the United States with a view to placing the safeguards clauses in their bilaterals under the Agency's administration. Among these countries were Brazil, Denmark, Japan (also in respect to its bilateral with Canada), New Zealand, Norway, Portugal, Thailand and Viet-Nam.*

The United States announced that it would request IAEA to inspect – for an agreed period of time – the operation of four American reactors if the safeguards system submitted to the Conference came into operation. The reactors are two research reactors at Brookhaven National Laboratory, the Experimental Boiling Water Reactor at Argonne National Laboratory and the Organic Moderated Nuclear Power Plant under construction at Piqua, Ohio.



An artist's drawing of the nuclear power plant under construction at Piqua, Ohio, one of the four reactors that the United States Government has offered to place under IAEA's safeguards system

with less than 100 MW thermal output, to nuclear material used and produced in these reactors and to small research and development facilities. Procedures covering other types of nuclear facilities will be developed as the need arises.

Scope of Application

According to the document, safeguards are to be applied to the following types of nuclear material and facilities:

1. Nuclear material supplied by the Agency whenever the total amount of such "peaceful nuclear material" (i.e. material declared to be meant exclusively for peaceful purposes) in the State concerned exceeds:

   (a) 2 metric tons in the case of natural uranium, or an equivalent amount of more highly enriched uranium, plutonium or uranium-233*;

* *200 grams of fully enriched uranium or of plutonium and uranium-233 are equivalent to the 2 tons of natural uranium specified in this prevision. The equivalence is determined in terms of quantities required for initiating a self-sustaining chain reaction.*

It might be pointed out that the various types of nuclear material contain varying proportions of fissile material, i.e. material which can sustain a fission chain reaction. Ordinary uranium contains one fissile isotope, uranium-235, which is the only fissile substance in nature. This isotope constitutes about 0.7 per cent of natural uranium, the rest being almost entirely uranium-238 which is not fissile. Uranium-238, however, can be converted into plutonium which is a fissile substance. Another fissile substance is uranium-233 which can be produced from thorium. The fissile content of ordinary uranium (i.e. the proportion of the fissile atoms present) can be artificially increased, producing what is known as enriched uranium.

The natural and slightly or moderately enriched uranium, normally used as fuel in reactors, is not the type of material that constitutes the main component of a weapon. But in the normal operation of a reactor, some of the non-fissile uranium-238 turns into plutonium; this fissile substance can be extracted from the spent reactor fuel and possible used in a weapon. In certain types of reactors, thorium can be made to yield uranium-233 which can also be used in nuclear weapons.

The amount of material needed for a self-sustaining chain reaction depends not only on the actual fissile content but also on several other characteristics of the material as a whole.

(b) 4 tons in the case of depleted uranium with a uranium-235 content of less than .5 per cent; and

(c) 4 tons in the case of thorium.

(The safeguards, however, will be applied in a nominal manner if the quantity of the peaceful nuclear material in the State does not exceed 10 metric tons in the case of natural uranium or the equivalent amount of more highly enriched material referred to in (a) above, and 20 metric tons in the case of depleted uranium or thorium referred to in (b) and (c) above.)

2. "Special fissionable material" (i.e. uranium-235, uranium-233, plutonium and enriched uranium, as distinct from "source material" which includes natural uranium, thorium and uranium depleted of its fissile isotope) produced as a result of the use of material which is itself placed under safeguards;

3. Special fissionable material used, produced or processed in a nuclear facility which is itself subject to safeguards;

4. Any material while it is inter-mixed with safeguarded material;

5. "Principal nuclear facilities" (i.e. reactors, fuel processing plants and isotope separation plants) supplied or substantially assisted by the Agency, as well as specialized equipment or non-nuclear material that can substantially assist such facilities or in any other way further a military purpose. (Reactors with a maximum power of less than 3 MW will, however, be exempted provided that the total power of exempted reactors in a State does not exceed 6 MW); and

6. Any facilities while they are processing, using, storing or transporting safeguarded material.

Safeguards will not be applied in conjunction with the supply of mining equipment or ore-processing plants.

Procedures for Application

Safeguards will be applied in accordance with provisions to be specified in agreements for Agency assistance entered into by the Agency with the State or States concerned. The main considerations in determining the relevance of particular safeguards to a project will be the form, scope and amount of Agency assistance, the specific character of each individual project and the degree to which the assistance could further a military purpose.

The provisions to be specified may include (a) examination and approval of designs by the Agency, (b) maintenance by the State concerned of an agreed system of records, (c) submission to the Agency of routine and special reports, and (d) inspections by the Agency.

The design of facilities will be examined by the Agency to ensure that it will not further any military purpose and will permit the effective application of the safeguards.

The State concerned will maintain records concerning safeguarded facilities and material; the plan for the system of records is to be submitted to the Agency for agreement. The records will cover details of operation as well as accounting of material and equipment.

The system of reporting on safeguarded facilities and material will be based on agreement between the Agency and the State. The State will submit operating reports as well as accounting reports showing the receipt, issue and location of the material. In addition, the State will notify the Agency within 48 hours (a) if any unusual incident occurs or (b) if material is lost or unaccounted for in quantities exceeding what is considered normal. Furthermore, the State will report to the Agency at least two weeks before (a) any transfer or other transaction resulting in a change in the facilities concerned, and (b) any proposed major change in the program stated in the routine reports.

Routine inspections that may be made by the Agency will include the examination of the safeguarded facility to ensure that it is constructed according to the approved design, and the testing of equipment for measuring material in the facility. After the facility is in operation, the routine inspections will include the examination of the safeguarded facility or material, audit of reports and records, verification of the amounts of material, and examination of measuring techniques. Special inspections will be made if the need is indicated by the special reports, or in the event of unforeseen circumstances requiring immediate action.

When the safeguards are applied in a nominal manner, only one routine report will be required each year and no routine inspections will be carried out, but special reports will be submitted and special inspections made as necessary.

The west face of the Graphite Research Reactor at Brookhaven National Laboratory near New York City. This reactor is another of the four which the USA has offered to place under IAEA safeguards

Certain additional procedures are proposed for reactor facilities and concern, among other things, the number and frequency of routine inspections. The frequency will depend on the nature of the reactor as well as the nature and amount of the nuclear material used or produced in it, and will seek to ensure that in the interval between inspections the total possible error in measuring the quantity of nuclear material used or produced in the reactor cannot amount to more than 0.2 kg of completely fissile material or its equivalent in any other type of nuclear material. For example, a 2 MW pool type research reactor using 90 per cent enriched fuel will, under this formula, be subject to a maximum of one routine inspection per year, while a maximum of six inspections per year will be made of a graphite moderated natural uranium power reactor with a thermal power capacity of 100 MW.

IAEA PROGRESS REPORTED TO UN GENERAL ASSEMBLY

(Introductory statement by IAEA's Director General, Mr. Sterling Cole, in presenting the Agency's Annual Report to the General Assembly of the United Nations, 12 December 1960)

1. Mr. President, I have pleasure in presenting to the General Assembly the fourth annual report of the International Atomic Energy Agency, as required by the Agency's Statute. This is before you in two parts, the greater one being the report of the Agency's Board of Governors to the General Conference covering the period July 1959 - June 1960 (document A/4531), and an addendum to that document which is a supplement covering developments since that date and giving a summary of action taken by the General Conference at its fourth regular session in September this year.

2. The General Conference opened this year the same day as this Assembly and it is therefore still fresh in our minds. I am pleased to inform you that in my view it was the most constructive and encouraging conference that we have had since the Agency was set up a little more than three years ago. In saying this, of course, I do not gloss over the serious problems which still confront the Agency. In this connection, I cannot do better than refer to a comment made in the course of the debate by the delegate of India, the distinguished scientist, Dr. Bhabha, who is well known to many of you here. He said: "I think all of us here would agree that if this Agency had not been created in 1957, the urge for such an organization would be even greater today than it was four years ago."

The validity of Dr. Bhabha's statement is fortified by the fact that production of nuclear weapons material would seem to be within the reach of more and more governments as present technology improves.

3. Before going into the affairs of the Agency I think that the Assembly would be interested in a brief picture of the present state and prospects of the peaceful uses of atomic energy. The general picture throughout the world has not changed substantially since I spoke to you last year. However, the use of isotopes and radiation continues to flourish and expand, and to bring new benefits to industry, medicine and agriculture. Here the Agency is beginning to see the first fruits of its own work of spreading this technology in the less developed areas. On the other hand, the main use foreseen from nuclear energy, the production of cheap electric and motive power, and heat, still remains to most countries a prospect for the future rather than a reality for the present, although today's assessment is generally more optimistic than that of, say, two years ago. The Agency's scientific conference on small and medium-sized power reactors held in September this year showed that there are good prospects for important if not spectacular technical improvements, particularly in the larger reactors. Several large nuclear power stations have come into operation in the past year or are on the point of beginning their work. I would reiterate that all signs still point to the likelihood that nuclear power will first become competitive in the larger plants and under special circumstances, but in isolated areas nuclear power even now offers challenging prospects. Plans for the construction of nuclear power plants are also going ahead in other than the atomic countries as, for instance, in Brazil, India and Japan. The first nuclear ship for peaceful purposes, the Soviet