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OF THE
BOARD OF GOVERNORS
TO THE
GENERAL CONFERENCE

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CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
INTRODUCTION	1 - 13	1
PROGRAMMES OF ACTIVITY	14 - 126	3
Technical assistance and training	14 - 27	3
Food and agriculture	28 - 41	9
Life sciences	42 - 51	13
Physical sciences	52 - 62	16
Nuclear power and reactors	63 - 84	20
Health, safety and waste management	85 - 100	25
Information and technical services	101 - 108	29
Safeguards	109 - 126	32
ADMINISTRATION	127 - 147	42
External relations	127 - 132	42
Personnel	133 - 134	42
Finance	135 - 143	45
Legal Matters	144 - 145	48
Public information	146 - 147	48

ANNEXES

- ANNEX A THE BOARD OF GOVERNORS
- ANNEX B FELLOWSHIPS OFFERED OR PROVIDED FREE OF CHARGE
IN 1968
- ANNEX C RESEARCH CONTRACTS
1. Total value of contracts in 1968
 2. Analysis by subject matter of contracts awarded or renewed in 1968
 3. Analysis by country of contracts awarded or renewed in 1968
- ANNEX D CONFERENCES, SYMPOSIA AND SEMINARS HELD DURING
THE PERIOD 1 JULY 1968-30 JUNE 1969
- ANNEX E STATUS OF FINANCIAL CONTRIBUTIONS TO THE AGENCY
ON 30 JUNE 1969
1. Advances to the Working Capital Fund and contributions to the Regular Budget for 1969
 2. Outstanding contributions to the Regular Budgets for 1958-1968
 3. Voluntary contributions to the General Fund for 1968 and 1969

List of abbreviations

Agency	International Atomic Energy Agency
ECAFE	Economic Commission for Asia and the Far East of the United Nations
ENEA	European Nuclear Energy Agency of the Organisation for Economic Co-operation and Development
EURATOM	European Atomic Energy Community
FAO	Food and Agriculture Organization of the United Nations
IAEA	International Atomic Energy Agency
IAGC	International Association of Geochemistry and Cosmochemistry
IATA	International Air Transport Association
IAU	International Association of Universities
ICSU	International Council of Scientific Unions
ILO	International Labour Organisation
IMCO	Inter-Governmental Maritime Consultative Organization
INIS	International Nuclear Information System
IPA project	Regional Joint Training and Research Programme using a Neutron Crystal Spectrometer under the Agreement between the Agency and the Governments of India and the Philippines (reproduced in documents INFCIRC/56 and Add.1)
IUGS	International Union of Geological Sciences
IUPAC	International Union of Pure and Applied Chemistry
JCAR	Joint Commission on Applied Radioactivity of ICSU
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NORA project	Joint Norway/Agency research programme in reactor physics with the Zero Power Reactor "NORA"
NPY project	Co-operative research project in reactor physics under the Agreement between the Agency and the Governments of Norway, Poland and Yugoslavia (reproduced in documents INFCIRC/55 and Add.1)
UNDP(SF)	United Nations Development Programme (Special Fund component)
UNDP(TA)	United Nations Development Programme (Technical Assistance component)
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization

NOTE

All sums of money are expressed in United States dollars.

INTRODUCTION

1. During the period covered by this report the Agency has continued to expand certain of its activities. In particular, in view of the rapidly growing utilization of nuclear facilities by Member States, the importance of the Agency's statutory role to apply safeguards is increasing considerably. Although the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is not yet in force, its requirements relating to international safeguards and its promise of further development of the applications of nuclear energy for peaceful purposes are already engaging the Agency's attention.
2. The Board is reporting separately on two of the subjects referred to it by the General Conference in 1968. The first[1] is in response to the request for a review of Article VI of the Statute. In its resolution on the subject[2], the Conference expressed the desire that the Agency should be in a position to carry out the new responsibilities which it will assume with the eventual entry into force of NPT, and the Board was requested to study ways and means by which its membership would adequately reflect the progress and development of the peaceful uses of atomic energy, an equitable geographical distribution and the continuing need for the Board's effectiveness as the Agency's executive body. In view of the wide interest in the subject, the Board considered that it was important to obtain the views of Members of the Agency not serving on the Board, and at its meetings in February 1969 it set up an Ad Hoc Committee of the Whole to study the matter. The Ad Hoc Committee met from 15-17 April and 3-4 June, some 50 Members of the Agency being represented at its meetings. Memoranda submitted by Belgium, the Democratic Republic of the Congo, Italy, Mexico, Pakistan and the United Arab Republic, putting forward suggestions for possible amendments to Article VI of the Statute, were before the committee.
3. The second separate report is on the Agency's responsibility to provide services in connection with nuclear explosions for peaceful purposes.[3] The Board has requested the Director General to make this report[4] available to the Secretary-General of the United Nations to assist him in preparing the report requested by the General Assembly in Resolution 2456 C (XXIII) on the establishment within the framework of the Agency of an international service for nuclear explosions for peaceful purposes under appropriate international control.
4. The General Conference's attention is also drawn to the progress report which has been made to the Secretary-General in response to General Assembly Resolution 2456 A (XXIII), paragraphs 3 and 4, on the action the Agency has taken in connection with certain of the recommendations made by the Conference of Non-Nuclear Weapon States last September.[5] The Secretariat has also given its help to the Group of Experts that the Secretary-General appointed pursuant to paragraph 8 of the same Resolution to prepare a full report on the contributions of nuclear energy to the economic and scientific advancement of the developing countries. This collaboration has taken the form of providing the Group with all the information it required about the Agency's activities, as well as contributing to the work of the United Nations Secretariat in preparing a first draft of the Group's report.

[1] GC(XIII)/408.

[2] GC(XII)/RES/241.

[3] Pursuant to the Conference's Resolution GC(XII)/RES/245.

[4] GC(XIII)/410.

[5] GC(XIII)/INF/110.

5. A number of steps have been taken to prepare for the entry into force of the NPT. The Department of Safeguards and Inspection has been re-organized. More attention is being given to stimulating and co-ordinating safeguards research and development including the use of instruments. A group of consultants is preparing a report on the manner in which safeguards should be applied when entire national atomic energy programmes rather than individual facilities are to be safeguarded. The first training course for new safeguards inspectors was held in June 1969.

6. By 30 June 1969, 13 Latin American countries had ratified the Treaty for the Prohibition of Nuclear Weapons in Latin America (the Tlatelolco Treaty). Of these, 12 had waived the conditions preventing the immediate entry into force of the Treaty and it is therefore in force between these States; consequently they will be required, under Article 13 of the Treaty, to conclude comprehensive safeguards agreements with the Agency.

7. In February 1969 the Board decided to launch INIS on a limited basis in 1970. The operation of INIS will be reviewed annually by an advisory committee, including scientists, information specialists and administrators, appointed by the Board.

8. The rate of new orders for nuclear power plants throughout the world has remained steady at about 35 000 MW(e) per year. Inflationary pressures have affected capital costs of nuclear power. The size of nuclear power units, which now appears to be economical, is large compared to power needs in many developing countries. This, together with high and rising capital costs for such plants, seems at present to delay the introduction of nuclear power in such countries. The Agency's ability to influence the availability of investment capital is limited. The emergence of a cheaper small or medium-sized nuclear power plant could have an important effect, and the Agency is endeavouring to encourage progress in this direction, but the difficulties should not be underestimated. The Agency is also giving more emphasis to the prospecting and development of nuclear fuel sources.

9. Economic smaller plants could also be of importance for the future of nuclear desalting. The main international developments in this field during the past year have been a symposium in Madrid in November 1968; the completion of the joint Agency/Mexico/United States of America feasibility study and the start of a study, with which the Agency is associated, of one or more agro-industrial complexes in the Middle East. The latter is being undertaken by the Oak Ridge National Laboratory of the United States.

10. In health, safety and waste management there has been further progress in orienting the programme towards field activities and increased co-operation with WHO.

11. The programme for the application of atomic energy in food and agriculture is yielding results of direct benefit to farmers in many developing countries and has been singled out by the United Nations Advisory Committee on Science and Technology, as one which merits much increased support by both the Agency and FAO. The Agency's other programmes to foster nuclear science techniques in medicine and biology, in industry and geology and in hydrology, are also concentrating on the problems of developing countries and are being increasingly dovetailed into the overall health, industrial and water resource projects of other United Nations organizations.

12. The Agency and UNESCO have agreed on an arrangement for the joint operation of the International Centre for Theoretical Physics at Trieste for a period of five years from 1970.

13. Last year the General Conference was informed that the resources available for the Agency's regular programme of technical assistance would enable it to meet less than 30% of Member States' requests for experts and equipment in 1968. [6] In 1969 the Agency's ability to respond has dropped still further to about 25%. While a few Members have increased their contributions in the last year, it does not seem likely that more than 70% of the \$2 million target will be met in 1969 as compared with 68.43% in 1968. The Director General has addressed new appeals to Member States and is bringing unsatisfied requests to the attention of technically advanced Members with some, but not very significant effect.

[6] GC(XII)/380, para. 10.

PROGRAMMES OF ACTIVITY

TECHNICAL ASSISTANCE AND TRAINING

General

14. Table 1 below outlines the Agency's technical assistance activities in respect of the 1968 programme. [7] All of the resources put at the Agency's disposal in support of these activities are reflected in the Table, namely: UNDP(TA) funds; voluntary contributions from Member States to the General Fund; Type II fellowships, cost-free expert services and grants of equipment in kind.

Table 1

Technical assistance activities

Type or description of assistance	1968 (planned)	1968 (implemented) ^{a/}
Number of experts and visiting professors	160	106
Number of expert man-months	671	540
Value of equipment (in dollars)	646 700	749 200 ^{b/}
Number of fellowships awarded, including Types I, II and UNDP(TA)	260-280	315
Average length of fellowship award (in months)	9.5	9.4
Number of countries receiving both experts and equipment	46	37
Number of countries receiving experts only	4	9
Number of countries receiving equipment only	-	4
Number of training courses and study tours	10 ^{c/}	10 ^{c/}
Number of training course lecturers and regional advisers	79	77
Number of participants at study tours and training courses	140 ^{d/}	132 ^{d/}
Average duration of a training course or study tour (in months)	2.0	1.9
Number of visiting seminars	3	3
Average participation in each visiting seminar	150	281
Number of scientific visits	12	9
Average number of institutes included in scientific visits	6	7

a/ As these data constitute a status report on 1968 projects as at 31 December 1968 - reflecting the various stages of implementation and projects on which work had not yet begun - the figures will not always be identical with those in document GC(XIII)/INF/111, as the figures in the latter report include data on all technical assistance provided in 1968, irrespective of the year for which it was originally planned.

b/ Includes UNDP(TA) equipment allocations originally planned for implementation in 1967, which were carried forward and obligated in 1968.

c/ Nine training courses and one study tour.

d/ This figure does not include local and other participants whose cost of attendance is borne by the Government or by another organization.

[7] A detailed report on the technical assistance provided by the Agency, with special reference to 1968, is being submitted separately in GC(XIII)/INF/111.

15. Assistance amounting to over \$1 million is provided each year from UNDP(TA) resources. Under recently introduced programming procedures, however, the entire responsibility for securing approval of requests for assistance in the nuclear energy field from UNDP(TA) now lies with Member States, which set their own priorities as between the various elements of assistance. Funds under UNDP(TA) are becoming increasingly tied up in continuing projects, leaving very little to cover the type of projects financed by the Agency's regular programme of technical assistance. The regular programme funds must therefore be used to enable the initiation of projects that can later be followed up by support from UNDP(TA) or UNDP(SF).

16. As a result of a proposal made during the last session of the General Conference[8], the Board in February 1969 discussed the possibilities of obtaining finances from international sources for nuclear projects, particularly in developing countries. The Director General was asked to explore urgently any possible sources of additional funds.

Trends in the regular programme since 1962

17. 1962 is chosen as a starting point since it was in respect of that year's operational programme that the target of \$2 million for voluntary contributions to the General Fund was first set. Table 2 below shows that the value of requests rose from \$1.5 million in 1962 to \$3.7 million in 1969, while the percentage of requests approved fell from 49.5% to 26.4%.

Table 2

Agency's regular programme 1962-1969

Year	Value of requests received (in thousands of dollars)	Value of assistance approved (in thousands of dollars)	Percentage of requests met
1962	1 530	757.6	49.5
1963	1 750	857.8	48.9
1964	2 400	804.6	33.3
1965	2 500	874.0	35.0
1966	3 000	901.6	30.0
1967	2 600	975.0	37.5
1968	3 600	977.0	27.1
1969	3 700	977.0	26.4

18. The percentage of all regular programme technical assistance that was earmarked for equipment rose from 18.7% in 1964 to 23.7% in 1969. The number of countries for which requests were approved under the regular programme nearly doubled from 25 in 1962 to 46 in 1969.

19. Sixty-nine requests were approved under the 1969 regular programme; a further 47 were found to be technically sound but could not be met because of lack of funds. These latter requests were brought to the attention of technically advanced Member States in the hope that they may be able to provide at least some of the assistance needed.

20. The cost of a given number of units of technical assistance (equipment, man-months of expert services, fellowship training) rose by at least 21.6% between 1962 and 1967, according to United Nations estimates. Costs have continued to rise since 1967 and the resources of the Agency have therefore continued to decline in real terms.

Training

21. In 1968, 315 fellowships were awarded, as compared to 269 in 1967; one of the main reasons for the increase was the more extensive use of Type II fellowship offers.

[8] See documents GC(XII)/COM.1/108 and GC(XII)/COM.1/OR.82.

Table 3

Distribution of Type I, Type II and UNDP(TA) fellowship awards

Country programme awards	1967	1968
Individual projects	235	299
Co-operative international projects	34	16
Total awards	269	315

A list of fellowships offered or provided as assistance in kind (Type II awards) by Member States in 1968 is given in Annex B.

22. The Agency and UNESCO jointly held a panel of experts on nuclear science teaching in July 1968 in Bangkok to review the present status of and need for teaching of topics related to nuclear science at the secondary and early university level, and to suggest appropriate means by which these topics might be introduced into the science curricula. The report of the panel contains recommendations for the development of secondary school and early university curricula, training programmes for teachers, the preparation of teaching materials and safety standards for handling of radioactive materials in school and university laboratories.

23. During the period covered by this report, 12 scientists from eight countries received awards for scientific visits. Between 1 July 1968 and 30 June 1969, nine visiting professors took up their assignments.

24. Listed in Table 4 below are the ten training courses and the visiting seminar carried out by the Agency in 18 countries (including the nine countries visited by the seminar). Three training courses were conducted together with FAO, through the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, and WHO sent fellows and lecturers to two of the Agency's courses. 129 participants from abroad and 692 participants from host countries took part. During the same period three regional advisers were in the field.

Table 4

Regional and inter-regional training projects

Title	Place and dates	Number of applications received ^{a/}	Participation ^{b/}			Lectures	
			(1)	(2)	(3)	Out-side	Agency's staff
Regional training course on the application of radioisotopes ^{c/}	Cairo, Middle Eastern Regional Radioisotope Centre for the Arab Countries 1 April to 31 July 1968	11	11	-	10	-	3
Inter-regional training course on radioisotope techniques in medicine ^{c/}	Moscow 3 June to 16 August 1968	12	10	-	-	-	1
Inter-regional advanced training course on medical applications of radioisotopes ^{c/}	Bucharest and Predeal, Romania 17 June to 12 July 1968	23	13	-	6	6	4
International training course on use of radiation and isotope techniques in horticultural research ^{d/}	Hanover, Federal Republic of Germany 22 July to 13 September 1968	55	19	-	1	4	5
Regional training course on waste management ^{c/}	Rio de Janeiro 14 to 25 October 1968	11	8	-	11	4 ^{e/}	2
Regional training course on industrial application of radioisotopes ^{c/}	Cairo, Middle Eastern Regional Radioisotope Centre for the Arab Countries 19 October to 11 December 1968	6	6	-	10	1	1
Visiting seminar on food irradiation ^{c/}	Nine countries in South East Asia and the Far East 6 January to 7 February 1969	-	-	-	642	1	2
Inter-regional training course on radiation microbiology ^{c/}	Bombay, India 7 April to 16 May 1969	16	12	4	6	3	2
Inter-regional training course on radioisotope production ^{c/}	Warsaw 5 May to 13 June 1969	14	13	-	6	3	4
International training course on the use of radiation and mutagen treatments for crop improvement ^{f/}	Casaccia, Italy 12 May to 20 June 1969	34	15	-	-	6	5

Title	Place and dates	Number of applications received ^{a/}	Participation ^{b/}			Lectures	
			(1)	(2)	(3)	Out-side	Agency's staff
International advanced training course on food irradiation technology and techniques ^{d/}	Massachusetts, United States of America 16 June to 25 July 1969	34	18	-	-	-	1

a/ Applications are normally reviewed in respect of non-host country candidates only, that is, those included under participation groups (1) and (2) shown in the next column.

b/ (1) denotes awards for participation at the Agency's expense;
 (2) denotes participation at the expense of the Government or of another organization; and
 (3) denotes the number of local participants who attended at no cost to the project.

c/ Financed under UNDP(TA).

d/ Regular programme project which was partially financed by FAO and the host country.

e/ Includes one cost-free lecturer provided by the United States.

f/ Financed by FAO and the host country.

UNDP(SF) activities

25. Field operations for the Central American regional project on the eradication of the Mediterranean fruit fly, which were due to be completed on 31 August 1968, were extended to 30 June 1969. On the occasion of the annual review of UNDP in June 1969, advance authorization was given for a further extension to 30 June 1970 of field operations on a more limited scale. During this extension the Agency and other interested parties are exploring possibilities of finding sources of support for mounting a post-project, large-scale demonstration of the sterile male technique for the suppression of the Mediterranean fruit fly in a well-defined and limited area.

26. The project in India on nuclear research in agriculture[9] is progressing satisfactorily. The preparation of the detailed programmes for the work to be carried out at the four research institutes co-operating in the project has been completed.

27. The Agency has sent out advisory missions to several Member States in Latin America, Asia and the Far East, to assist in the evaluation of possible UNDP(SF) projects in such fields as surveys of nuclear raw materials and the use of radiation and radioisotopes in agriculture and industry.

[9] GC(XII)/380, para. 27.

FOOD AND AGRICULTURE

General

28. As the Board pointed out last year, about half the work relating to food and agriculture is carried out by co-ordinated support of research on selected, well-defined problems [10]. Table 5 below summarizes all the research programmes at present supported.

Table 5

Co-ordinated programmes in food and agriculture

Research programme	Countries in which co-ordinated programmes are being carried out
1. Wheat fertilization	Brazil, Hungary, India ^{a/} , Italy ^{a/} , Lebanon, Mexico, Morocco, West Pakistan, Peru, Romania, Turkey, United Arab Republic
2. Tree crop fertilization	Ceylon ^{a/} , China, Colombia, Ghana, Ivory Coast ^{a/} , Japan ^{a/} , Kenya, Malaysia ^{a/} , Philippines, Spain
3. Physical-chemical relationship of soils and plants	Australia, Belgium, Canada ^{a/} , Denmark ^{a/} , Ghana, Hungary (1 + 1 ^{a/}), India, Madagascar, Netherlands ^{a/} , Pakistan (2)
4. Water use efficiency	Belgium, Brazil, Iran, Iraq, Israel, Kenya, Lebanon, West Pakistan, United Arab Republic
5. Use of neutrons for seed improvement	Austria, Bulgaria, China, France ^{a/} , Federal Republic of Germany ^{a/} , India, Italy ^{a/} , Netherlands ^{a/} , Philippines, Puerto Rico ^{a/} , Thailand, United Kingdom ^{a/} , United States (3 ^{a/})
6. Rice mutation breeding	Brazil, Ceylon, China, India, Japan ^{a/} , Republic of Korea, East Pakistan, West Pakistan, Philippines, Thailand, Viet-Nam
7. Production and use of induced mutations in plant breeding	Argentina, Australia, France ^{a/} , Denmark ^{a/} , Federal Republic of Germany ^{a/} , India ^{a/} , Italy (2 ^{a/}), Japan ^{a/} , Sweden (2 ^{a/}), United States (2 ^{a/}), Yugoslavia ^{a/}
8. Seed protein improvement	China, Denmark (2 ^{a/}), Federal Republic of Germany ^{a/} , Philippines, Sweden (3 ^{a/})
9. Control of livestock insect pests by the sterile-male technique	El Salvador, France ^{a/} , Federal Republic of Germany ^{a/} , Kenya, Portugal, United Kingdom ^{a/} , Venezuela
10. Control of rice stem borers by the sterile-male technique	China (2), Japan, Republic of Korea, Pakistan (2), Thailand

[10] Ibid., para. 46.

Research programme	Countries in which co-ordinated programmes are being carried out
11. Control of insect populations by the sterile-male technique	Australia ^{a/} , Austria ^{a/} , Federal Republic of Germany ^{a/} , Israel, Peru, Portugal, Spain, United Arab Republic, Yugoslavia
12. Isotopes and radiation in control of parasitic diseases	Czechoslovak Socialist Republic, Denmark ^{a/} , Hungary, Israel ^{a/} , Italy ^{a/} , Kenya (2), United Kingdom ^{a/} , United States ^{a/} , Yugoslavia ^{a/}
13. Trace element metabolism and disease in animals of agricultural importance	Argentina, Austria ^{a/} , Denmark ^{a/} , Federal Republic of Germany (2 ^{a/}), Netherlands ^{a/} , United Kingdom (2 ^{a/}), United States (2 ^{a/}), Yugoslavia ^{a/}
14. Microbiological aspects of food preservation by irradiation	Australia ^{a/} , Federal Republic of Germany ^{a/} , Hungary ^{a/} , Japan (1 + 1 ^{a/}), Spain, Thailand, United States ^{a/}
15. Tissue physiology in food preservation by irradiation	Israel, Japan, Philippines (2)
16. General food irradiation	Denmark ^{a/} , Hungary, Republic of Korea, Netherlands (2), Spain (2)

a/ These contracts are "cost-free research agreements".

Soil fertility, irrigation and crop production

29. The programme dealing with soil fertility, irrigation and crop production concentrates on obtaining information on the most efficient use of the limited amounts of fertilizer and water available for farming in many countries. The co-ordinated projects on rice and maize fertilization, which were concluded in 1968, clearly showed the unique precision that can be obtained by using isotopically labelled fertilizers. The current programme consists chiefly of practical field experiments to study soil-plant-water relations and the uptake of nitrogen and phosphate fertilizers.

30. The first research programme - wheat fertilization - shown in the table above started in 1968 and will last 4-5 years. The second programme - tree crop fertilization - has been in progress for three years and has already given valuable information on the nutrition of citrus, cocoa, coconut, oil palm and coffee. The programme on physical-chemical relationship of soils and plants gives information needed for interpreting the other co-ordinated programmes under this heading. The research programme on water use efficiency has shown the versatility of the neutron moisture meter and has provided for the first time accurate evapotranspiration data for selected crops grown in widely different conditions of soil and climate.

31. During the period under review a symposium, a training course and a study group meeting were held on topics related to soil fertility and irrigation.

Insect eradication and pest control

32. Promising results are being obtained in the UNDP(SF) project in Central America designed to demonstrate the effectiveness of the sterile-male technique for controlling the Mediterranean fruit fly. Experiments in Capri, Italy, have now been extended to the nearby island of Procida, and have also been started in Spain. The Agency's laboratory is carrying out research on the mass rearing and irradiation not only of the Mediterranean fruit fly, but also of the olive fly, codling moth and tsetse fly. It also trains scientists in the use of these techniques.

33. The co-ordinated radiation entomology programmes are numbered 9, 10 and 11 in the table above. Under No. 9 - control of livestock insect pests by the sterile-male technique - the work concentrates on the tsetse fly and has led to improvements in techniques for rearing this insect under laboratory conditions. The research programme on control of rice stem borers by the sterile-male technique was launched in 1968, and is a study on the application of the technique to one of the chief crop insect pests of Asia. A panel held in May 1968 recommended that pilot field tests should now be conducted since research work on the sterile-male technique has progressed far enough on more than 30 species of harmful insects. The cost of each field test, which would require several years, would range between \$50 000 and 500 000 per year.

Pesticide residues and food protection

34. The main developments under this heading have been:

- (a) A further report on the dietary patterns of populations in Africa, the Far East and Latin America;
- (b) Ground-work on a joint programme with FAO, WHO, ILO, UNIDO and IUPAC to provide a service to improve the reliability of analysis of trace compounds in biological materials of interest to the work of all these organizations;
- (c) A joint FAO/Agency/WHO seminar in Vienna in March 1969 on the agricultural and public health aspects of environmental contamination; and
- (d) The first steps taken by an expert panel to launch a programme to study the fate of pesticide residues in foods of major importance to international trade.

Plant breeding and genetics

35. A relatively small increase in the protein content of staple foods, such as cereals, which could be achieved by plant breeding, would provide millions of tons of protein. In response to the growing and world-wide interest in new and better sources of protein, a co-ordinated programme for more plant protein - concentrating on cereal grains which offer clear advantages over other sources - was launched in late 1968. As a result, some of the world's leading laboratories in the fields of biochemistry and nutrition, plant breeding and physics, are now co-operating to apply new nuclear techniques to the protein problem. The advantages of these techniques are twofold: radiation-induced mutations have been shown to produce cereals with a higher protein content and a better amino acid balance; and radioisotope techniques can provide faster and easier analysis on a mass scale of protein quantity and quality of seeds.

36. Research programmes in progress on plant breeding and genetics are numbered 5, 6, 7 and 8 in the table above. Under the programme on the use of neutrons for seed improvement, a simple neutron irradiation facility has been designed, tested and brought into operation in six pool-type reactors in various parts of the world. Co-ordinated

experiments have been carried out on a standardized biological material (barley seeds) with support from the Agency's laboratory. Basic studies of neutron radiobiology are being undertaken, and the programme is being extended to develop useful mutants of several local crop plants. The project on rice mutation breeding is now in its fifth year, and a number of improved rice mutant strains have been bred. One mutant contains twice as much protein as the mother strain and reaches maturity 60 days earlier. A new rice variety produced by gamma irradiation and released for use by farmers in Japan had the highest yield of rice in Japan in 1968.

37. The results obtained in trials of radiation-induced mutants of durum wheat in the Middle East, North Africa and Southern Europe were reported last year [11]. The mutants have continued to be superior not only in regard to better yields but also shorter straw, better standability and increased weight to given volume of wheat. Three have now been released for use by farmers.

Animal production and health

38. The co-ordinated programmes on animal production and health are listed as Nos 12 and 13 in the table above. Programme No. 13 on trace element metabolism and disease in animals of agricultural importance is leading to new approaches in the study of diseases caused by trace mineral deficiencies. Results under programme No. 12 have continued to show that radiation attenuation of helminthic larvae (parasitic worms) is the sole technique for preparing vaccines on a commercial scale against these organisms. Vaccines are now available for lungworms of cattle and sheep. Studies are being made of the possibility of producing commercial vaccines against liverfluke, gapeworm and hookworm in dogs. A programme is now being launched to use isotopic techniques in studying protein metabolism in domestic animals, particularly the utilization of nitrogen from non-protein sources (e. g. urea) by ruminants.

Food preservation

39. Recent events have underlined the importance of obtaining clearances by public health authorities so that individual radiation preserved foods may be released for human consumption. To this end, the Agency is expanding its clearing house functions on legislation adopted by Member States and on wholesomeness data. It is working with WHO with a view to obtaining general acceptance of irradiated potatoes, onions and wheat. It is also co-operating with ENEA in promoting an international programme on food irradiation with special emphasis on wholesomeness trials of specific products.

40. Under programmes Nos 14, 15 and 16 in the table above, which deal with food preservation, support is being given to research on particularly important topics, such as control of pathogenic bacteria; enzymological and physiological problems encountered in storing irradiated foods; control of insect infestation; and preservation of fresh fish and other sea food.

41. Advice is also being given on research programmes in various countries. A visiting seminar was sent to nine countries in South East Asia and the Far East in the first months of 1969.

[11] Ibid., para. 52.

LIFE SCIENCES

42. Work in the life sciences consists chiefly of research support, assistance to Member States in standardization and calibration, exchange of information and scientific advice on technical assistance programmes. The Agency's laboratories are extensively used in support of all these activities.

Nuclear medicine

43. The programme relating to nuclear medicine concentrates on helping to introduce the growing range of radioisotope techniques and on research support to this end. The present research support programme is summarized in Table 6 below. Particular attention is given to techniques useful in research on tropical and endemic diseases. To a growing extent these research support programmes are designed to fit into various related activities of WHO.

Table 6

Distribution of research contracts on radioisotope applications in medicine

Research topic	Countries in which research is conducted with Agency support
1. Anaemia	Cuba, Ghana, Greece, Republic of Korea, Lebanon (2), Madagascar, Pakistan, South Africa, Thailand, Turkey, United Arab Republic
2. Goitre	Austria, Bolivia, Iraq, Japan, Turkey, United Arab Republic
3. Malnutrition	Argentina ^{a/} , Brazil ^{a/} , Ecuador, Iran ^{a/} , Israel ^{a/b/} , Philippines ^{a/} , United Arab Republic
4. Radioisotope techniques and their applications in studies of iron metabolism	India
5. Radioactivation techniques and their applications in studies of trace element metabolism	Italy
6. In vitro assay techniques and their applications	Brazil, Bulgaria, Chile (2), Ecuador
7. Radioisotope and radioactivation techniques and their applications in studies of vectors and parasites	Philippines, Uganda
8. Radiopharmaceuticals and techniques for scintigraphy and their applications	Brazil, Israel, Poland, Uruguay, Viet-Nam
9. Radioisotope techniques in cardiovascular studies	Argentina, Spain

^{a/} Part of a co-ordinated research programme on the use of radioisotopes in the study of malnutrition in tropical and sub-tropical regions.

^{b/} Cost-free research agreement.

44. Research programmes Nos 1, 2 and 3 are now being phased out, whereas Nos 4 through 9 were launched in January 1969. They originated in a meeting held in May 1968 to review the general direction and scope of the Agency's research contract programme in radioisotope applications in medicine[12]. Research programmes Nos 4 and 5 are being developed as joint projects of the Agency and WHO, and also make use of the facilities of the Agency's laboratory. Dietary deficiencies in iron and in various trace elements may be important in relation to many diseases prevalent in the developing countries.

45. Other projects during the year included:

- (a) An advanced training course on medical applications of radioisotopes held in Romania in July 1968;
- (b) An Inter-regional training course on radioisotope techniques in medicine held in the Soviet Union during June-August 1968; and
- (c) A large symposium on medical radioisotope scintigraphy (the technique of mapping the distribution of radioactivity within organs of the body), held in Salzburg, Austria, in August 1968. This was the third meeting on the subject organized by the Agency.

Radiation biology

46. The current research support programmes in radiation biology are summarized in the following table:

Table 7
Distribution of research contracts
on radiation biology

Research topic	Countries in which research is conducted with Agency support
1. Mechanism of radiation injury	Argentina, Australia, Bulgaria, Chile, Greece, Hungary, Republic of Korea, Netherlands (3), Pakistan, Poland, Romania (2), Turkey
2. Modification of radiation injury	Algeria, India
3. Radiobiological applications	Austria, Denmark, Ecuador, Ethiopia, Greece, Hungary, Italy, Republic of Korea, Malaysia, Nigeria, Thailand, Turkey, Yugoslavia

In addition, the Agency had cost-free research agreements with the Czechoslovak Socialist Republic, Denmark, Hungary (3), Israel and Italy.

47. Research programmes 1 and 2 are designed to obtain more knowledge about the radiosensitivity of living systems and in particular, the relationship between radiation and cancer and radiation and human mutations. [13] Under these programmes the Agency:

[12] Ibid., para. 63.

[13] GC(XII)/385, paras 144-146.

- (a) With the collaboration of WHO held a symposium in Athens from 28 April to 2 May 1969 on radiation-induced cancer. The symposium reviewed the results of the latest research on this subject and discussed factors that must be taken into account in radiotherapy;
- (b) In collaboration with WHO prepared a manual on radiation haematology to give public health authorities, doctors, scientists and the atomic energy industry information on the effects of radiation on the tissues that produce blood cells; and
- (c) Published a number of issues of the International Chromosome Analysis Newsletter, reporting data from computer analyses of human chromosome injury caused by radiation and other environmental factors.

48. Work in connection with the third research programme - radiobiological applications - is designed chiefly to promote various medical uses of radiation. Under this heading the Agency also held:

- (a) A panel on bone marrow transplantation, its conservation and culture, in Moscow in July 1968, which reviewed the latest techniques in the subject, and recommended activities to the Agency and WHO;
- (b) A panel on radiation damage to the biological molecular information system with special regard to the role of SH (sulfhydryl) groups, in Vienna in October 1968. This meeting reviewed developments of chemical radioprotectors used in protecting healthy tissues during radiotherapy of patients;
- (c) A panel on the use of ionizing radiation for sterilization and preservation of biological tissues, in Budapest in June 1969;
- (d) A panel on radiosensitivity of toxins and animal poisons, in May 1969 in Bangkok. The knowledge gained will help in using radiation to prepare vaccines and toxoids - e.g. to inactivate the toxic factors of snake venoms and to produce vaccines - and to detoxicate contaminated foodstuffs and food products; and
- (e) An inter-regional training course on radiation microbiology, in Bombay from April to May 1969, to give scientists from the region information on the practical applications of radiation such as sterilization of biomedical products, sanitary microbiology and food irradiation.

Dosimetry

49. In addition to research support to three contracts on dosimetry, the programme concentrated on developing a postal dose intercomparison service to enable laboratories and hospitals throughout the world to calibrate accurately cobalt-60 and other nuclear radiation sources now being increasingly used for cancer therapy and other purposes. After the completion of a pilot project and the publication of the results, a programme is being launched with the participation of over 100 hospitals and clinics in more than 30 countries.

50. In collaboration with WHO, a manual on basic dosimetry has been prepared, and the Agency is also helping WHO in establishing secondary standard laboratories for radiation dosimetry in various parts of the world.

51. With the participation of WHO the Agency is also collecting and publishing dosimetric data of importance for the planning of radiation treatment.

PHYSICAL SCIENCES

Physics

52. The Agency's programme on physics is designed to develop knowledge that will eventually be of practical application in reactor technology, fusion, use of neutron generators, and to help developing countries to play a role in nuclear physics and research. It relies chiefly on exchange of information (symposia, panels, etc.), and has started research support as summarized in the following table:

Table 8

Distribution of research contracts on physics

Research topic	Countries in which research is conducted with Agency support
1. Nuclear physics	Belgium, Hungary, Romania, Yugoslavia
2. Fission research	India, Italy
3. Radiation damage studies	Romania, South Africa, Union of Soviet Socialist Republics, United Kingdom
4. Solid-state physics	Finland, Hungary, Romania, Sweden, Yugoslavia

53. Individual projects undertaken include:

- (a) A panel in Dubna, Soviet Union, in July 1968 at which many of the world's leading experts discussed the present status and future tasks of research in nuclear physics and gave special attention to research that could be carried out in small institutes and in developing countries;
- (b) The third international conference on plasma physics and controlled nuclear fusion research in Novosibirsk, Soviet Union, in August 1968. This major conference attracted a very large number of participants and led to an exceptionally stimulating exchange of results of research. It was the consensus that a similar meeting should be held every third year;
- (c) A panel in May 1969 in Budapest to review the use of neutron generators for research in industrial processes and scientific education, and to indicate promising lines of research in this field. The panel gave particular attention to the use of such generators in developing countries and small laboratories;
- (d) Preparations to launch a new project in late 1969 that will replace the existing IPA project by a broader group of studies in solid-state physics. [14] A meeting was held in March 1969 in Manila to discuss the organization of the project; and

[14] See also para. 83 below.

- (e) A symposium on radiation damage in reactor materials, in Vienna in June 1969. The theoretical and experimental advances in studies of radiation damage were discussed. Particular emphasis was given to these studies in material important for reactor design and construction.

Nuclear data

54. The International Nuclear Data Committee sponsored by the Agency is now in full and effective operation. Good progress is being made towards a world-wide neutron information compilation and exchange system. Meetings convened between the four main centres - the Agency's Nuclear Data Unit, Brookhaven in the United States, Obninsk in the Soviet Union and the ENEA Centre at Saclay, France - helped to co-ordinate work and objectives, and led to the development of an exchange format which is compatible with the differing needs of the four centres.

55. The Agency's Nuclear Data Unit compiles part of the world's data and promotes exchange between the main centres. Since the Unit started working in August 1966 considerable progress has been made; the coverage of bibliographic data, i. e. references to new publications, is now complete and up to date on a world-wide scale; the compilation of numerical data has only begun and complete data coverage, past and current, will only be achieved in several years at the present rate of growth.

Chemistry

56. The Agency's work relating to chemistry consists chiefly of helping developing countries with regard to radioisotope production programmes and hot atom chemistry. For this purpose:

- (a) A second and more comprehensive manual on radioisotope production has been prepared, especially for reactor centres in developing countries;
- (b) A project on the control of the quality of radioisotopes and labelled compounds, especially those produced for medical use, at new centres, was launched in collaboration with WHO;
- (c) Advisory services were given on hot atom chemistry in China, the Philippines and Thailand and on the use of noble gas compounds in Yugoslavia; and
- (d) A co-ordinated research programme on hot atom chemistry is being launched.

Hydrology

57. Work relating to hydrology consists mainly of helping developing countries to use isotope hydrology and of co-operating with UNESCO in the International Hydrological Decade. The Agency is carrying out sub-contracts under UNDP(SF) water development projects in Algeria, Chad, India, Jordan, the Niger, Senegal, Spain and Tunisia, and is assisting national authorities in Argentina, Austria, the Czechoslovak Socialist Republic, Greece, Kuwait, Poland, Spain and Yugoslavia by providing isotope techniques for specific problems. These studies are not only of direct benefit to the country but also help the development of the techniques themselves in different climatic areas.

58. With regard to the International Hydrological Decade, the Agency provides the technical Secretariat for the working group on nuclear techniques in hydrology and has published a guide-book [15] on this subject. This is the first comprehensive review of the principles and applications of nuclear techniques in hydrology, and is written especially for the practising hydrologist. The working group is now studying the use of nuclear logging techniques which are not yet widely used in hydrology.

[15] Technical Report Series No. 91.

Table 9

Distribution of research contracts on radioisotope
applications in hydrology

Research topic	Countries in which research is conducted with Agency support
1. Basic research	Belgium, Denmark, France, Kenya
2. Development of field methods	New Zealand, Pakistan, Poland, South Africa, Spain
3. Field applications of isotope techniques to specific problems	China, Hungary (2), Kenya, Republic of Korea, Romania (2), Turkey

Industry

59. Work related to industry is now concentrating on promoting the use of nuclear techniques in the industries of developing countries, on prospecting and mining, on radiation processing, and on studies of environmental pollution and its control. Joint activities are being started with UNIDO. A new co-ordinated research programme on the use of radiation to produce fibre- and particle-boards for housing and packaging has been launched; this is of particular interest to fibre-producing countries in the Far East. Co-ordinated research programmes on industrial applications are summarized in the following table:

Table 10

Distribution of research contracts on radioisotope
applications in industry

Research topic	Countries in which research is conducted with Agency support
1. Neutron moisture gauging	Czechoslovak Socialist Republic, Denmark, Madagascar, Poland
2. Impregnated fibrous materials	China, Finland
3. Isotopic ratios in oil field evaluation	Romania
4. Analysis of ores by activation analysis	Poland

60. Other projects during the year have included:

- (a) A symposium on nuclear techniques in the prospecting and development of mineral resources, held in Argentina in November 1968. This showed how rapidly these techniques are spreading and demonstrated their potential for exploiting natural resources; and

- (b) A study group on nuclear techniques in water pollution investigations, Budapest, December 1968, which indicated that the Agency can play a greater role in fostering the use of these proven techniques in studying a problem of increasing seriousness throughout the world.

Centres and laboratories

61. The recent work of the Agency's laboratory at Seibersdorf and of the International Laboratory of Marine Radioactivity in Monaco is described in full in the sixth annual report of the Agency's laboratory activities. [16] The work of the International Centre for Theoretical Physics at Trieste is also described in detail in that report.

62. It may be added that:

- (a) An agreement has been reached between the Agency and UNESCO under which the two agencies will operate a joint programme for the International Centre for Theoretical Physics from 1970 onwards. Under the new agreement, the two organizations will make equal financial contributions to the costs of operating the Centre. The contribution of the Italian Government under its agreement with the Agency remains unchanged. An international training course on nuclear theory was held at the Centre from January to March 1969 and was attended by 187 physicists of whom 78 came from developing countries. The Centre's associateship scheme has attracted international attention as a means of diminishing the "brain drain";
- (b) At the laboratory of Seibersdorf a new facility for the mass rearing of the Mediterranean fruit fly and other insect pests was completed in December 1968. After radiation-induced sterility the insects are shipped to countries which are testing this method of insect control; and
- (c) The agreement with the Government of Monaco and the Institut Océanographique concerning the laboratory in Monaco was extended for five years from January 1969 until the end of 1974. The laboratory's work is being re-orientated towards the co-ordination and standardization of research on the effects of radioactivity on marine life. Special emphasis is to be placed on the management of radioactive wastes.

[16] IAEA Laboratories, 6th Annual Report, Tech. Rep. Series No. 98.

NUCLEAR POWER AND REACTORS

63. Four new power reactors became critical in 1968, raising the total installed nuclear capacity throughout the world from 10 685 MW(e) to 11 425 MW(e), generated by 84 power reactors. In 1969 it is expected that 23 power reactors with an aggregate capacity of 8200 MW(e) will go "on line".

64. Firm plans for 34 000 MW(e) of additional nuclear capacity were published in 1968 compared with 35 000 MW(e) in 1967. A lull in orders in the United States was largely offset by an increase in other countries, especially the Soviet Union, which announced a programme of 4-5000 MW(e). The forecast of world nuclear capacity for 1975 is 110 000 MW(e) and 300-350 000 MW(e) for 1980. The proportion of the plant built or to be built outside the main industrial countries is only 2% at present. It seems likely to be much less than 5% in 1975 and still under 5% by 1980.

65. Continued progress in technology makes it necessary for the Agency to co-ordinate efforts and encourage exchange of information even though there has been some standardization in reactor designs. The growth of the nuclear industry makes international action necessary to sponsor prospecting and exploitation of nuclear fuels and of the technology of the fuel cycle. Sophisticated economic evaluations and forecasts of nuclear industry requirements are needed as a basis for the plans of Member States and of the Agency itself. Developing countries are showing greater interest in nuclear energy in general and in new applications, such as desalting, nuclear energy complexes and nuclear explosions for peaceful purposes. The help that the Agency is giving to individual power projects or plans in developing countries is described more fully in the Addendum to the Agency's annual report to ECOSOC [17], which also provides detailed information on the support the Agency is giving to research reactors in these countries.

Technical aspects of nuclear power

66. A symposium on advanced and high temperature gas-cooled reactors (AGR and HTGR) held at Jülich, Federal Republic of Germany, in 1968, showed that HTGR systems will be competing with water reactors for a larger share of the nuclear market. Progress was reported on coated particle fuels and on the technology of concrete pressure vessels. Many of the technological developments in HTGRs will be applicable to the gas-cooled fast breeder reactor. The development of closed cycle gas turbines could reduce plant capital costs. It is also possible that gas-cooled fast breeders could be coupled with magnetohydrodynamic (MHD) power generating units. Recent advances in MHD were discussed at a symposium, the fourth of a series on this subject, in Warsaw in July 1968. On the basis of the information presented, the status of MHD was reviewed by the joint ENEA/IAEA International Liaison Group on MHD Electrical Power Generation which met in February 1969. The group is proving to be a useful instrument for world-wide co-operation in this advanced technology.

[17] INFCIRC/126/Add. 1.

67. Progress on fast reactors is being reviewed from time to time by the Agency's international working group on the subject which held a specialists' meeting on sodium-water reactions in Argonne, United States, in November 1968. The working group met in Vienna in March 1969 to exchange information on fast reactor programmes and to plan ahead for further meetings of importance to fast reactor development. A specialists' meeting in Winfrith, United Kingdom, in June 1969, reviewed the value of plutonium neutron-capture-to-fission ratio which is crucial in breeding and therefore of great importance in making feasibility evaluations of various fast reactor designs.

68. By 1980 the world's civilian power programmes will have produced about 400 tons of plutonium. This was noted by a panel on plutonium utilization held in Vienna in September 1968 which also concluded that the technology needed for re-cycling this valuable material, which should be put to productive use, will be available by the early 1970s. However, the relative economic merits of re-cycling plutonium in thermal reactors on the one hand and of stockpiling for future breeder reactors on the other, cannot yet be assessed.

69. The Agency periodically reviews the important question of the safety of reactor pressure vessels in operating nuclear power plants, and in October 1968 a working group met in Stockholm which completed the preparation of a general guide for the inspection of pressure vessels.

Nuclear fuels

70. The Agency's programme on all aspects of the fuel cycle has expanded and a continuing assessment is being made of uranium prospecting, uranium reserves and resources, production capability and future fuel demand. A further meeting of the Joint IAEA/ENEA Study Group at the end of 1968 prepared a report on uranium production and short-term demand, which shows that although it will be essential to find and develop new low-cost deposits by the mid 1970s, present prospecting programmes are likely to be successful in this regard, and no sharp rise in uranium prices is expected during the next decade. In this connection the Agency is supporting research on the recovery of uranium from low-grade deposits of minerals such as phosphates, in the hope that this will lead to a cheap supply of large quantities of uranium concentrates.

71. A panel on the reprocessing of highly irradiated fuels, held in May 1969, placed the main emphasis on the reprocessing of irradiated fuels from fast reactors. Some consideration was given to fuel from advanced types of thermal reactors including HTGR.

Supply of nuclear materials

72. In September 1968 the Board delegated authority to the Director General to take immediate action upon requests for small quantities of nuclear material for research and development purposes or for use in neutron sources provided that such requests are made within the framework of existing Master Agreements. Requests for larger quantities of nuclear materials will continue to be referred to the Board, which gave its approval for the following supply arrangements during the period under review:

Table 11

Supply of nuclear material

Receiving State	Purpose	Supply approved (approximate quantity)
Argentina	Fuel for training reactor	750 g ^{235}U contained in uranium enriched to about 20%
Bulgaria	Research	Five targets of each of the isotopes ^{235}U , ^{238}U , ^{232}Th , ^{238}Pu and ^{239}Pu , containing a total quantity of 10-12 mg of each isotope
India	Research	15 mg of ^{242}Pu and eight samples of special fissionable material containing a total of just above 5 g
Pakistan	Booster rods for KANUPP power reactor	1696 g of ^{235}U contained in uranium enriched to about 10.5%
Poland	Research	Milligram quantities ^{a/}

^{a/} This request is being implemented by the Director General under the authority referred to above.

73. The allocation of special fissionable material to the value of \$50 000 granted by the United States for 1968 is shown in the following table:

Table 12

Allocation of special fissionable material granted by the United States for 1968

Receiving State/organization	Value in dollars
Pakistan	25 169
Philippines	14 530
Spain	10 000
The Agency ^{a/}	301
	<hr/> 50 000

^{a/} Seven grams of plutonium for safeguards purposes.

Economic questions and nuclear power for developing countries

74. In the course of the year there have been several upward revisions of the capital costs of nuclear power stations. General inflationary factors also applying to conventional plants have accounted for part of these increases, and each case involving competition between nuclear and conventional power plants must be judged on its own merits. Consequently, any general quantitative conclusion would be misleading at this stage.

75. In the short term, the competitive position of nuclear power will continue to depend on low fuel cycle costs, and the data available on this subject continue to be highly encouraging. Additional indications have been obtained that uranium costs will not rise substantially in the next decade, that fabrication and reprocessing costs will continue to decrease, that enrichment costs will remain stable, and that plutonium credits, though subject to short-term variations, are likely to rise. The combination of these factors points to a steady decrease in total fuel cycle costs.

76. Most nuclear power plants now being ordered are in sizes of 500 MW(e) and larger. For many developing countries having relatively small interconnected electric grids, smaller plants are needed. With the help of the United Nations the Agency is therefore carrying out a power market survey of the potential need by 1975-80 in developing countries for plants in the 100-500 MW(e) range. The Agency is also inviting potential supplier countries to join a co-ordinated research programme with a view to obtaining comprehensive data on the technical and cost assessment of such smaller plants, so that realistic feasibility studies can be made in individual cases.

77. In this connection, reference should be made to a briefing seminar held in Singapore in June 1968 which was organized in co-operation with ECAFE and brought together senior power planners and utility executives from the region to discuss the role that nuclear energy could play in their programmes. It was indicated that China, the Republic of Korea and the Philippines may decide on their first nuclear plants in a year or two. The Agency has also sent power missions to Brazil, Chile, Greece, the Republic of Korea and Yugoslavia.

Nuclear desalting and energy centres

78. In last year's report reference was made to the long-term promise that is held out by "agro-industrial complexes" which may produce desalted water cheaply enough for agricultural use as well as feeding cheap power and heat to a cluster of energy-intensive industries.[18] To review recent developments and prospects for nuclear desalting and for such complexes, the Agency convened a symposium in November 1968 in Madrid. Amongst the main points discussed were results of studies of agro-industrial complexes in India, Israel, Spain and the United States, as well as current information on desalting research, nuclear reactors suitable for desalting applications and nuclear desalting plant cycles.

79. The Oak Ridge National Laboratory of the United States is making studies with the Agency's assistance of the feasibility of installing one or more agro-industrial complexes in certain countries of the Middle East.

80. The joint Agency/Mexico/United States feasibility study of a large dual-purpose plant near the head of the Gulf of California is now being considered by the two Governments.

[18] GC(XII)/380, para. 39.

The study shows a minimum need of 500 million gallons per day rising to 1300 in 1980 and doubling in another 15 years. A 2000-MW(e) dual-purpose plant producing 1000 million gallons per day could be constructed by scaling up present technology. It would be operational about eight or nine years after the decision to proceed.

Nuclear explosions for peaceful purposes

81. In the light of General Conference Resolution GC(XII)/RES/245 the Board is submitting a separate report on the Agency's responsibility to provide services in connection with nuclear explosions for peaceful purposes. [19]

Reactor physics and reactor research

82. At the beginning of 1969, information available to the Agency showed that a total of 360 research reactors were in operation throughout the world and another 25 under construction; of these 39 were in operation and two under construction in developing countries.

83. The completion of the NORA project in June 1968 was marked by a seminar in Norway in August 1968 which reviewed the achievements of the project and in particular the many new measurements on light- and heavy-water reactor lattices. The NPY project was extended to 1970 and, under its sponsorship, a seminar on the numerical solution of multidimensional diffusion equations was held in Poland in March 1969. The third regional project, the IPA project, has also been completed. It has helped to increase the capacity of the Philippines Atomic Energy Centre to undertake basic and applied research in solid-state physics studies using neutron beams, and has helped to launch similar activities in several other countries in the region. It will be replaced by a new and broader agreement, plans for which were drawn up at a meeting in the Philippines in March 1969. [20] This meeting benefited from the fact that many reactor specialists from the area were already present in the Philippines attending a panel on the utilization of research reactors in training staff for nuclear power systems - a matter of broad topical interest in South East Asia - and a study group meeting on research reactor utilization, which considered research projects suitable for joint efforts by the centres of the region in subjects such as in-pile neutron measurements and hot atom chemistry.

84. A panel on reactivity measurements, which met in Vienna in December 1968, clarified certain concepts in this field thus making possible greater precision in analysis of reactor safety and reactor operations. The Agency also collaborated with ENEA in a seminar, held in Norway in September 1968, on the application of on-line computers to nuclear reactors, which reviewed progress in this rapidly developing field.

[19] GC(XII)/410.

[20] See also para. 53 above.

HEALTH, SAFETY AND WASTE MANAGEMENT

General

85. Work under the Agency's programme of health, safety and waste management was marked by the following:

- (a) More help to developing countries. During the period under review the Agency was involved in radiation protection, waste management and nuclear safety work in eight States of which seven were developing (Argentina, Chile, China, Pakistan, Thailand, United Arab Republic and Venezuela);
- (b) Increased co-operation with WHO, particularly in revising the Agency's standards, codes and manuals, as well as in dealing with current activities;
- (c) The first steps towards a new direction of the activities of the laboratory in Monaco;
- (d) Increased radiation protection work in connection with the Agency's own activities, e. g. laboratories and safeguards, and a review of the Agency's arrangements for giving emergency assistance to Member States;
- (e) The publication of three guide-books on health and safety, two on waste management and two on nuclear safety and new issues of the Waste Management and Health Physics Research Abstracts for which the demand is increasing. The main aim for the publication of manuals and guide-books is to provide developing countries with technical procedures and data needed in the performance of their work in national centres; and
- (f) The first steps for reviewing the Agency's Regulations for the Safe Transport of Radioactive Materials.

Research support

86. Tables 13 and 14 below show the distribution of research contracts and agreements relating to radiation protection and waste management.

Table 13

Distribution of radiation protection research contracts and agreements

Research topic	Countries in which research is conducted with Agency support
1. General matters of radiation protection	Czechoslovak Socialist Republic (2), Italy, Romania, Yugoslavia
2. Measurement techniques	Brazil, Federal Republic of Germany, India, Republic of Korea, Poland (2)
3. Transport packagings	Sweden

Table 14

Distribution of waste management research
contracts and agreements

Research topic	Countries in which research is conducted with Agency support
1. Research in marine radioactivity ^{a/}	Argentina ^{b/} , India ^{b/} , Italy(2 ^{b/}), Israel, Japan ^{b/} , New Zealand ^{b/} , Norway ^{b/} , Poland ^{b/} , Romania(2 ^{b/}), Spain ^{b/} , Yugoslavia ^{b/}
2. Low- and medium-level radioactive waste management	Bulgaria, China, Federal Republic of Germany ^{b/} , Hungary, India(2 ^{c/}), Republic of Korea, Pakistan, Philippines, Romania, United Arab Republic (3), Union of Soviet Socialist Republics (3), Yugoslavia

^{a/} Research programme co-ordinated with the laboratory in Monaco.

^{b/} Cost-free research agreements.

^{c/} One contract is cost-free to the Agency, being financed by the United States.

Health and safety

87. Preparations have begun for the major review in 1970 of the Agency's Regulations for the Safe Transport of Radioactive Materials, and in March 1969 representatives of competent authorities of a number of countries that are actively engaged in such transport met in Stockholm to discuss the practical difficulties encountered and to suggest methods of overcoming them.

88. The Agency has been informed that the Restricted Articles Board of IATA unanimously recommended that one uniform set of regulations, based closely on the Agency's transport regulations, be adopted for the acceptance and carriage of radioactive materials by air.

89. A joint Agency/WHO symposium in Vienna in May 1969 attended by 211 experts from 34 countries dealt with the main problems to be expected in handling radiation accidents, and reviewed the lessons learned from accidents that have been reported.

90. A regional seminar on radiation protection monitoring for countries in South East Asia and the Far East was held in collaboration with WHO in Bombay, India, in December 1968. The seminar, which was the first of its kind to be held in the region, was exceptionally well attended and obviously met a need felt in many countries. It dealt with practical problems such as monitoring, interpretation of readings, instrumentation from the point of view of the special climatic and other conditions encountered in the region.

91. A more broadly focused seminar on agricultural and public health aspects of contamination of the environment by radioactive materials was held by the Agency, WHO and FAO in Vienna in March 1969. This was especially designed to give the persons responsible in ministries of agriculture and public health a broad scientific background of the environmental contamination that may arise from the expansion of the nuclear industry and ways of dealing with it.

92. Two panels of experts were held during the period under review:

- (a) In November 1968, a research co-ordination meeting on the problems of detecting and assessing uranium and plutonium in the human body and on research required thereon. It was recommended that the Agency should develop a standard phantom for the calibration of chest monitors and encourage Member States to set up a register of persons who have accidentally acquired significant plutonium body burdens. This could possibly be extended to a centralized international register; and
- (b) In February 1969, a panel on nuclear accident dosimetry systems designed to facilitate the development of more standardized alarm systems and to improve the existing instruments.

Waste management

93. A symposium in New York, in August 1968, reviewed experience in dealing with airborne radioactive wastes and drew, in particular, on experiences of the United States in this field. Recommendations were made about the Agency's programme on this subject, especially concerning noble gases, which will become more important with the spread of nuclear power.

94. A basic regional training course in radioactive waste management was held in Brazil in October 1968. Participants from six Latin American countries attended lectures and discussions on regional problems of waste management.

95. To help the laboratory in Monaco to reorient its programmes so as to give more emphasis to standardization, a panel was held in Vienna in November 1968 on reference methods for marine radioactivity studies. It made recommendations about the calibration between laboratories of analytical methods and techniques, especially sampling and monitoring.

96. Three panels of experts were held:

- (a) In December 1968, in Dubna, Soviet Union, a panel of experts discussed the use of bitumen for making radioactive wastes insoluble; the results will be published in due course;
- (b) In January 1969, a panel held in Vienna up-dated the Agency's manual on the disposal of radioactive wastes into fresh water of which a revised edition will be published in the Agency's Safety Series; and
- (c) In May 1969, a panel on the use of local minerals in treating radioactive wastes made recommendations and drew conclusions of particular interest to developing countries.

97. In December 1967 the Agency asked Member States to provide information concerning radioactive waste disposal into the seas and oceans with the intention of establishing an international sea disposal register. To date 22 States have replied (Brazil, Canada, China, El Salvador, Finland, Federal Republic of Germany, Guatemala, Haiti, India, Italy, Republic of Korea, New Zealand, Nicaragua, Nigeria, Pakistan, Panama, Philippines, Portugal, Sweden, United Arab Republic, United States and Yugoslavia). Of these, China, Republic of Korea, New Zealand, Philippines and Sweden provided information on actual disposal data.

98. Advisory missions were sent to Argentina, Chile, Pakistan and Venezuela on local problems of handling waste from reactors or, in the case of Pakistan, from a reprocessing facility now under construction in that country.

Nuclear safety

99. In collaboration with IMCO, recommendations on the use of ports and approaches by nuclear merchant ships, and a manual of guidance on the application of meteorology to safety at nuclear plants have been published. The Agency's code of practice for the safe operation of nuclear plants will be issued shortly. In February 1969, the Board authorized the Director General to promulgate, as part of the Agency's Safety Standards, the code of practice for the safe operation of critical assemblies and research reactors, which is of particular importance to countries which are developing their first nuclear centres.

100. Nuclear power plant siting evaluations were made in China, in October 1968, and in Thailand in November 1968. As one of the steps towards a study of possible effects of earthquakes on nuclear power plants - a question of growing interest, particularly to developing countries located in earthquake zones - a mission was sent to Italy in December 1968 to investigate the seismic characteristics of the Brassimone site where a fast, sodium-cooled reactor will be installed.

INFORMATION AND TECHNICAL SERVICES

INIS

101. INIS will begin operations on a limited basis in 1970. The plan of operation was drawn up during the first half of 1968 by an international team of consultants, and reviewed in October 1968 by a panel of technical experts from 23 Member States and four international organizations. INIS is expected to consist of the following broad features:

(a) Input

Member States, or groups of Member States, will report to the Agency on new nuclear literature published in their territories. For each item of literature they will provide a full bibliographic description, a set of keywords to define the subject matter treated, and an abstract of the text. If the text is not one readily available through commercial channels, the Member State will also supply a full copy;

(b) Processing

The Agency will receive these data, edit them to ensure necessary consistency, and prepare a merged file. The bibliographic descriptions and keywords will be recorded on magnetic computer tape, the abstracts and full texts on microfiches; and

(c) Output

The Agency will make available to Member States copies of the magnetic tape file. It will also produce a printed announcement bulletin directly from the magnetic tape. This bulletin (with appropriate indexes), together with copies of the microfiche files of abstracts and full texts, will be available for purchase by any scientific institution.

102. The Agency is establishing the necessary standards to ensure that the INIS file has sufficient precision and consistency to permit effective retrieval of information. Work has proceeded on the definition of the subject scope of the system, on the rules of bibliographic descriptions, and on the formats to be used for computer records. In principle, EURATOM has accepted a contract under which it will make much of its experience, and in particular its thesaurus of keywords, available for use in INIS. The Agency has also participated in the study made by UNESCO and ICSU, which aims at achieving minimum standards of consistency between different computer-based systems for handling scientific information.

Computer services

103. During the year, the IBM 1401 computer was replaced by an IBM system 360 model 30. The activity of the computer was limited by difficulties in recruiting staff, and by the need to convert existing programmes for the new computer.

104. Training programmes were carried out to familiarize the computer staff with the new machine and with the programming languages that can be used with it. Familiarization courses were also held to acquaint the staff with the capabilities and limitations of computer technology. The Agency participated in discussions with other United Nations organizations - including UNIDO - leading towards the joint use of computer facilities and the avoidance of duplication in programming effort.

Scientific meetings

105. Comparative information for 1967 and 1968 in respect of conferences, symposia and seminars is given in the following table:

Table 15

Conferences, symposia and seminars

Item	1967	1968
Meetings	15	13
Participants	2275	2665
Countries taking part	53	65
Papers presented	700	974

Publications

106. The table below shows a break-down of the Agency's publications by subject:

Table 16

Publications

Subject	1967 %	1968 %
Nuclear power and reactors	20	25
Nuclear research	20	20
Health, safety and waste management	15	9.5
Food and agriculture	6.5	10
Life sciences	6	6.5
Theoretical physics	3.5	3.5
Public information	4	4
References and miscellaneous	25	21.5

107. Revenues from sales and publications amounted to \$148 000 in 1968, whereas the commercial value of publications distributed free to Member States amounted to \$470 000.

Library

108. The comparative library holdings are shown in the following table:

Table 17

Library holdings

Nature	End 1967	End 1968 ^{a/}
Books	29 600	30 500
Reports	105 800	115 000
Periodical subscriptions	1 150	1 200
Films	450	500
Film loans to Member States	650	805
Book, document, periodical, microfiche and other loans	76 901	50 898

a/ Partly because of lack of space, attempts have been made to keep the collection at about its present size.

SAFEGUARDS

Organizational changes

109. The Department of Safeguards and Inspection has been reorganized to deal with the growth and diversification of its work as follows:

- (a) The Division of Operations has the primary task of applying Agency safeguards. Within the Division an Accounts and Reports section maintains safeguards records and accounts and promotes the standardizing of operational procedures for incorporation in safeguards agreements and arrangements;
- (b) The Division of Development has the primary task of developing safeguards methods and technology. It deals with systems studies, technical services and training, and will apply the results of research and development work to individual facilities and test new procedures, methods and instruments; and
- (c) An Administrative Section, under the direct supervision of the Inspector General, handles non-technical aspects of the safeguards work and gives support to both Divisions.

Implementation of Agency safeguards

110. As shown in Table 19 at the end of this section, by 30 June 1969 the Board had approved a total of 40 safeguards agreements involving 30 States. [21]

111. During the period under review, the Board:

- (a) Approved a safeguards transfer agreement relating to the bilateral co-operation agreement between Turkey and the United States;
- (b) Approved five new safeguards transfer agreements, one with Japan and the United Kingdom to replace the one concluded in 1967, one with Iran and the United States to replace the one concluded in 1964, one with Argentina and the United States to replace the one concluded in 1966, one with Austria and the United States to replace the one concluded in 1965, and finally one with Portugal and the United States to replace the one concluded in 1965; and
- (c) Authorized the Director General to include a full set of safeguards provisions in the project agreement to be concluded with the Governments of Argentina and the Federal Republic of Germany in connection with the SUR-100 zero-power reactor project at the University of Rosario.

112. The safeguards transfer agreement relating to the bilateral co-operation agreement between Brazil and the United States, approved by the Board on 22 February 1966, entered into force on 31 October 1968.

[21] For the purpose of these statistics a safeguards agreement is taken as any agreement to which the Agency is a party that specifies that safeguards are to be applied. This means that agreements expressly exempting from safeguards the material covered are not included, but agreements under which materials may be exempted later are included as long as exemption has not been granted.

113. When all the agreements listed in Table 19 come into force, they will cover the reactor facilities listed in Table 20 with an aggregate thermal capacity of approximately 3277 MW. Most of the thermal capacity is accounted for by power stations in Japan, Spain, the United Kingdom and the United States. However, as pointed out last year [22] these lists give only a partial picture of the safeguards workload, since much of the material concerned is outside reactor facilities and separately accounted for, under the Agency's system; e. g. reprocessing facilities present more complex safeguards problems than nuclear power reactors. The following table illustrates the status of safeguards work on 30 June 1969 as compared with the status on 30 June 1968:

Table 18

Description	30 June 1968	30 June 1969
Reactor facilities under safeguards	68	70
Separate accountability areas, outside reactor facilities	37	37
	105	107

114. As of 31 December 1968 the following quantities of nuclear material were under Agency safeguards:

- (a) Source material: 1 027 tons;
- (b) Enriched material: 81 203 kg; and
- (c) Plutonium: 529 kg.

115. The second inspection of the Nuclear Fuel Services Incorporated plant at West Valley, New York, commenced in May to cover the processing of 20 tons of irradiated fuel from the Yankee Atomic Power Station, [23] and is expected to terminate in July.

116. During the period under review 64 inspections were made in 11 Member States compared with 31 in 16 Member States during the preceding 12 months. Three pre-operational visits were made to three Member States. The corresponding figures in 1967-68 were eight and seven respectively.

Research and development programme

117. The work of the Division of Development is based on the research and development programme that the Board and the General Conference reviewed in 1968. The programme has been elaborated to conform to the needs of the Agency's safeguards operations and to take into account work being done in Member States. It will be reviewed in the light of the report of a group of consultants [24] and the recommendations of panels held during 1969. Special attention has been given to the elaboration of a systems analysis. The results of this study will serve as a basis for formulating technical criteria and guidelines for applying safeguards in different situations and to various parts of or to entire

[22] GC(XII)/380, para. 117.

[23] Ibid., para. 120.

[24] See para. 126 below.

fuel cycles. The development of safeguards methods and techniques has continued chiefly through nine research and technical contracts. New contracts to the total value of \$76 850 were placed during the year with the Czechoslovak Socialist Republic, the Federal Republic of Germany, the Soviet Union and the United States. Table 21 at the end of this section shows the institutes to which research contracts were awarded, the topic and duration of the contracts and the amount of the Agency's contribution.

118. The results of research and development efforts will be tested in safeguards operations. A beginning has been made with a review of safeguards practices used for reprocessing plant campaigns and for testing statistical concepts in evaluating inspection results, and with investigating techniques for measuring input and estimating production.

119. The technical services required in implementing safeguards are being established. They include the services of analytical laboratories in Member States to make analyses on a routine basis and in a referee capacity. The role of the Agency's laboratory in providing such services is also being evaluated.

120. In September 1968, the United States lent the Agency two portable safeguards instruments, namely, a neutron coincidence counter and a Picker 100 channel analyser. The Agency is also arranging for the exchange of certain instruments with the United States Government in order to test instruments in the field, evaluate their usefulness and develop improved versions. Agency inspectors have also used in inspections portable gamma spectrometers originally developed by the United Kingdom Atomic Energy Authority which are now commercially available. Modifications of the same instrument by the United Kingdom Atomic Energy Authority have also been used by inspectors to make neutron measurements.

121. So far the instruments have been used chiefly for qualitative measurements of safeguarded material. Potentially they could be used for quantitative measurement by comparing results with standard samples and by employing statistical analysis.

122. Another good example of the interest shown by Member States in the development of safeguards instrumentation is provided by the Danish Research Establishment, Risø, which has successfully developed special safeguards instrumentation for verifying the operation of a reactor facility over a given period.

123. A panel on safeguards methods for reactors was held in Vienna in September 1968 which defined basic technical and operational problems of applying safeguards to specific types of power and research reactors. It made recommendations on possible solutions and on the development of safeguards measures for reactors. Safeguards methods for conversion plants and fuel fabrication plants were discussed at a panel meeting from 14 to 18 April by participants from ten States [25]. Inter alia the panel made useful recommendations for the allocation of priorities to various safeguards research and development tasks; and emphasized the need for the establishment of design criteria for plants to facilitate the incorporation of certain features which would increase the effectiveness of safeguards and economy in their application.

124. For the first time a formal training course for new Safeguards Inspector was held in June 1969. The course of one month's duration was attended by ten staff members. The programme included an explanation of the Agency's Safeguards System and its legal and procedural aspects, safeguards procedures for principal nuclear facilities and the use of safeguards instrumentation. Further familiarization with the work is planned to take place by on-the-job training at Headquarters and in association with inspectors in the field.

[25] Argentina, Canada, France, Federal Republic of Germany, India, Japan, Sweden, the Soviet Union, the United Kingdom and the United States. In addition there were observers from Belgium, the Czechoslovak Socialist Republic, Denmark, Israel, EURATOM and ENEA.

Notification of transfers of nuclear materials

125. Notifications of international transfers of nuclear materials have been received from Canada and Norway covering the period 1 January to 31 December 1968, and from the United States for the period 1 January to 30 June 1968.

Work in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

126. The Secretariat has been studying the possible impact of the NPT on the Agency's safeguards work and in particular the manner in which safeguards should be applied in countries that conclude arrangements with the Agency for the application of its safeguards to entire nuclear programmes for peaceful purposes rather than, as hitherto, to individual facilities. The Secretariat was assisted in this work by consultants made available by the Governments of Canada, Denmark, Hungary, the Soviet Union, the United Kingdom and the United States. The report of the consultants is expected to be available in the latter part of 1969.

Table 19

Safeguards Agreements approved by the Board of Governors
(except those that have expired or been cancelled)

State(s)	Subject	Entry into force	INFCIRC
<u>Project Agreements</u>			
Argentina	RAEP Reactor	1 Dec 1964	62
Congo, Democratic Republic of the	TRICO Reactor	27 Jun 1962	37
Finland	FiR-1 Reactor	30 Dec 1960	24
	FINN Sub-critical assembly	30 Jul 1963	53
Iran	UTRR Reactor	10 May 1967	97
Japan	JRR-3	24 Mar 1959	3
Pakistan	PRR Reactor	5 Mar 1962	34
Philippines	PRR-1 Reactor	28 Sep 1966	88
Spain	Coral I Reactor	23 Jun 1967	99
Uruguay	URR Reactor	24 Sep 1965	67
Viet-Nam	VNR-1 Reactor	16 Oct 1967	106
Yugoslavia	TRIGA II Reactor	4 Oct 1961	32
<u>Transfer Agreements</u>			
(Bilateral co-operation agreements between the indicated States)			
Argentina/USA ^{a/}		1 Mar 1966	79
Australia/USA		26 Sep 1966	91
Austria/USA ^{b/}		13 Dec 1965	76
Brazil/USA		31 Oct 1968	110
Canada/Japan		20 Jun 1966	85
China/USA		29 Oct 1965	72
Colombia/USA			
Denmark/UK		23 Jun 1965	63
Denmark/USA		29 Feb 1968	112
Greece/USA		13 Jan 1966	78
Indonesia/USA		6 Dec 1967	100
Iran/USA			127
Israel/USA		15 Jun 1966	94
Japan/USA		10 Jul 1968	119
Japan/UK		15 Oct 1968	125
Korea/USA		5 Jan 1968	111
Philippines/USA		19 Jul 1968	120
Portugal/USA ^{c/}		15 Dec 1965	77
South Africa/USA		26 Jul 1967	98
Spain/USA		9 Dec 1966	92
Thailand/USA		10 Sep 1965	68
Turkey/USA		5 Jun 1969	123
Venezuela/USA		27 Mar 1968	122
Viet-Nam/USA		25 Oct 1965	71
<u>Unilateral submissions</u>			
China	MZFR Power Reactor		
Mexico	All nuclear activities	6 Sep 1968	118
United Kingdom	Bradwell facility	1 Sep 1966	86
United States	Yankee Nuclear Power Station	1 Aug 1964	57
	Brookhaven graphite research reactor		
	Brookhaven medical research reactor		
	Piqua Nuclear Power Station		

^{a/} The term of this agreement is due to expire on 19 July 1969. It will be replaced by a new agreement which has already been approved by the Board.

^{b/} The term of this agreement is due to expire on 18 January 1970. It will be replaced by a new agreement which has already been approved by the Board.

^{c/} The term of this agreement is due to expire on 13 July 1969. It will be replaced by a new agreement which has already been approved by the Board.

Table 20

Reactors^{a/} under Agency safeguards or containing safeguarded material
under agreements approved by the Board of Governors^{b/}

Member State	Name of reactor	Location	Type	Capacity MW(th)	In opera- tion	Maximum routine inspections per year ^{c/}
Argentina	RA-1/Argentine Reactor 1	Constituyentes	Argonaut	.10	x	0
	RA-2/Argentine Reactor 2	Constituyentes	Argonaut	.00	x	1
	RA-3/Argentine Reactor 3	Ezeiza	Pool-tank	5.00	x	1
Australia	HIFAR	Lucas Heights	Tank	10.00	x	2
	MOATA	Lucas Heights	Argonaut	.01	x	3
Austria	SAR/Argonaut Graz Research Reactor	Graz	Argonaut	.00	x	0
	AUSTRIAN TRIGA MARK II Research Reactor	Vienna	Triga II	.25	x	0
	ASTRA	Seibersdorf	Pool-tank	5.00	x	2
Brazil	IEAR-1	São Paulo	Pool	5.00	x	2
	TRIGA I	Belo Horizonte	Triga I	.00	x	0
	ARGONAUT	Rio de Janeiro	Argonaut	.00	x	0
(Colombia)	(IAN-R ₁)	Bogotá	Light-water	.10	x	0
China	THOR/Tsing Hua Open Pool Reactor (MZFR Power Reactor)	Hsin-chu	Pool	1.00	x	1
		Lincou Hsian	Heavy-water	205.00		
Congo, Democratic Republic of the	TRICO	Leopoldville	Triga I	.05	x	0
Denmark	DR-1	Risø	Homogeneous	.002	x	1
	DR-2	Risø	Tank	5.00	x	2
	DR-3	Risø	Tank	10.00	x	3
Finland	FiR-1	Otaniemi	Triga II	.25	x	0
Greece	GRR/Greek Research Reactor	Athens	Pool	1.00	x	1
Indonesia	TRIGA II/Bandung	Bandung	Triga II	.25	x	0
Iran	UTRR	Teheran	Pool	5.00	x	2
Israel	IRR-1	Yavne	Pool	5.00	x	2
Japan	JRR-1/Japan Research Reactor 1	Tokai-mura	Aqu. -hom.	.05	x	0
	JRR-2/Japan Research Reactor 2	Tokai-mura	Tank	10.00	x	3
	JRR-3/Japan Research Reactor 3	Tokai-mura	Tank	10.00	x	1
	JRR-4/Japan Research Reactor 4	Tokai-mura	Pool	1.00	x	1
	JPDR/Japan Power Demonstration Reactor	Tokai-mura	Boiling-water	46.70	x	2
	SHCA/Semi- Homogeneous Critical Assembly	Tokai-mura	Crit. Fac.	.00	x	0
	AHCF/Aqueous Homogeneous Critical Facility	Tokai-mura	Crit. Fac.	.00	x	0
	TCA I/Tank-Type Critical Assembly	Tokai-mura	Crit. Fac.	.00	x	0

Member State	Name of reactor	Location	Type	Capacity MW(th)	In opera- tion	Maximum routine inspections per year ^{c/}	
Japan (cont.)	TCA II/Tank-Type Critical Assembly	Tokai-mura	Crit. Fac.	.00	x	1	
	Sumitomo Critical Assembly	Tokai-mura	Crit. Fac.	.00	x	0	
	Rikkyo University Research Reactor	Yokosuka-shi	Triga II	.10	x	0	
	Musashi College of Technology Research Reactor	Kawasaki-shi	Triga II	.10	x	0	
	Kinki University Research Reactor	Fuse-shi	UTR-B	.00	x	1	
	TRR/Toshiba Research Reactor	Kawasaki-shi	Pool	.03	x	0	
	HTR/Hitachi Training Reactor	Kawasaki-shi	Pool	.10	x	1	
	HCA/Hitachi Critical Assembly	Kawasaki-shi	Crit. Fac.	.10	x	1	
	Nippon Atomic Industry Group Critical Assembly	Kawasaki-shi	Crit. Fac.	.00	x	0	
	KUR/Kyoto University Research Reactor	Kumatori-cho	Pool	1.00	x	2	
	JMTR-CA/Japan Material Testing Reactor Critical Facility	Tokai-mura	Crit. Fac.	.00	x	2	
	FCA/Fast Critical Assembly	Tokai-mura	Crit. Fac.	.00	x	5	
	Tokai-mura Nuclear Power Station	Tokai-mura	Magnox	585.00	x	A	
	JMTR/Japan	Orai	Tank	50.00	x	3	
	Korea, Republic of	TRIGA II/Seoul	Seoul	Triga II	0.10	x	0
	Mexico	National Institute of Nuclear Energy Reactor	Mexico City	Triga III	1.00		0
Pakistan	PRR/Pakistan Research Reactor	Rawalpindi	Pool	5.00	x	2	
Philippines	PRR-1/Philippine Research Reactor	Diliman	Pool	1.00	x	1	
Portugal	RPI/Portuguese Research Reactor	Sacavem	Pool	1.00	x	1	
South Africa	SAFARI-I Critical Assembly	Pelindaba	Tank	20.00	x	3	
		Pelindaba	Crit. Fac.	.00	x	1	
Spain	ARBI	Bilbao	Argonaut	.01	x	0	
	ARGOS	Barcelona	Argonaut	.01	x	0	
	CORAL I	Madrid	Zero energy fast reactor	.00		5	
	JEN I	Madrid	Pool	3.00	x)	1	
	JEN II	Madrid	Pool	.00	x)	1	
	José Cabrera Nuclear Power Station	Almonacid de Zorita	Press. water	510.00		A	
Thailand	TRR-1/Thai Research Reactor 1	Bangkok	Pool	1.00	x	1	
Turkey	TR-1	Istanbul	Pool	1.00	x	1	
United Kingdom	Two reactors at the Bradwell Nuclear Power Station	Bradwell	Magnox (2)	1100.00	x	A	
	ZEBRA/Fast Critical Assembly	Winfrith	Crit. Fac.	.00	x	A	

Member State	Name of reactor	Location	Type	Capacity MW(th)	In opera- tion	Maximum routine inspections per year ^{c/}
United States	BGRR/Brookhaven Graphite Research Reactor	Long Island (N. Y.)	Graph. Mod.	20.00	x	A
	BMRR/Brookhaven Medical Research Reactor	Long Island (N. Y.)	Tank	3.00	x	1
	PNPF/Piqua Nuclear Power Facility	Piqua (O.)	Org. Mod.	45.50	x	2
	Yankee Nuclear Power Station	Rowe (Mass.)	Press. water	600.00	x	A
Uruguay	URR/Uruguay Research Reactor	Montevideo	Lockheed	.10		0
Venezuela	RV-1	Caracas	Pool	3.00	x	
Viet-Nam	VNR-1/Viet-Nam Research Reactor 1	Dalat	Triga II	.25	x	0
Yugoslavia	TRIGA II/Yugoslav Research Reactor	Ljubljana	Triga II	.25	x	0

a/ As defined in documents INFCIRC/26, Part II, para. 14 and INFCIRC/66/Rev. 2, Part IV, para. 80.

b/ Where Member State and/or name of reactor are given in brackets, the agreement is not yet in force.

c/ A = Access at all times.

Table 21
Contracts for safeguards research and development

Duration of contract	Title	Institute	Amount of Agency's contribution in dollars
1967-69	Integrated power monitors for safeguards	South African Atomic Energy Commission, National Research Centre Pelindaba, South Africa	5 000
1968-69	Development of safeguards technical practices for pressurized water power reactors	J. V. Kurchatov Institute for Atomic Energy Moscow, Soviet Union	20 000
1968-69	Development of safeguards procedures for a reprocessing plant similar to the WAK type	Institut für angewandte Reaktorphysik, Kernforschungszentrum Karlsruhe, Federal Republic of Germany	10 000
1968-69	Development of safeguards procedures for heavy water moderated, cooled and reflected pressurized water type reactors	Institut für angewandte Reaktorphysik, Kernforschungszentrum Karlsruhe, Federal Republic of Germany	10 000
1968-69	Analysis of the possibility of estimation of the plutonium quantity produced in nuclear power plants on the basis of measured quantity of generated electricity	Nuclear Power Research Group and Computing Centre Prague, Czechoslovak Socialist Republic	5 000
1969-70	Analysis of uranium burn-up and plutonium build-up in fast reactors	Institute of Physics and Power Engineering Obninsk, Soviet Union	20 000
1969	Development of safeguards procedures for scrap processing activities and associated studies	E. R. Johnson Associates Washington, D. C.	13 850
1969	Technical services in connection with plutonium measurements for minor isotopes; Safeguards Techniques (MIST) Programme	Nuclear Fuel Services Inc. West Valley, United States	18 000
1969-71	Determination of the accumulation of transuranium elements in spent fuel from the first atomic power stations	Institute of Physics and Power Engineering Obninsk, Soviet Union	nil

GROWTH OF AGENCY SAFEGUARDS

LEGEND:

————— Number of States with safeguards agreements ^{a/}

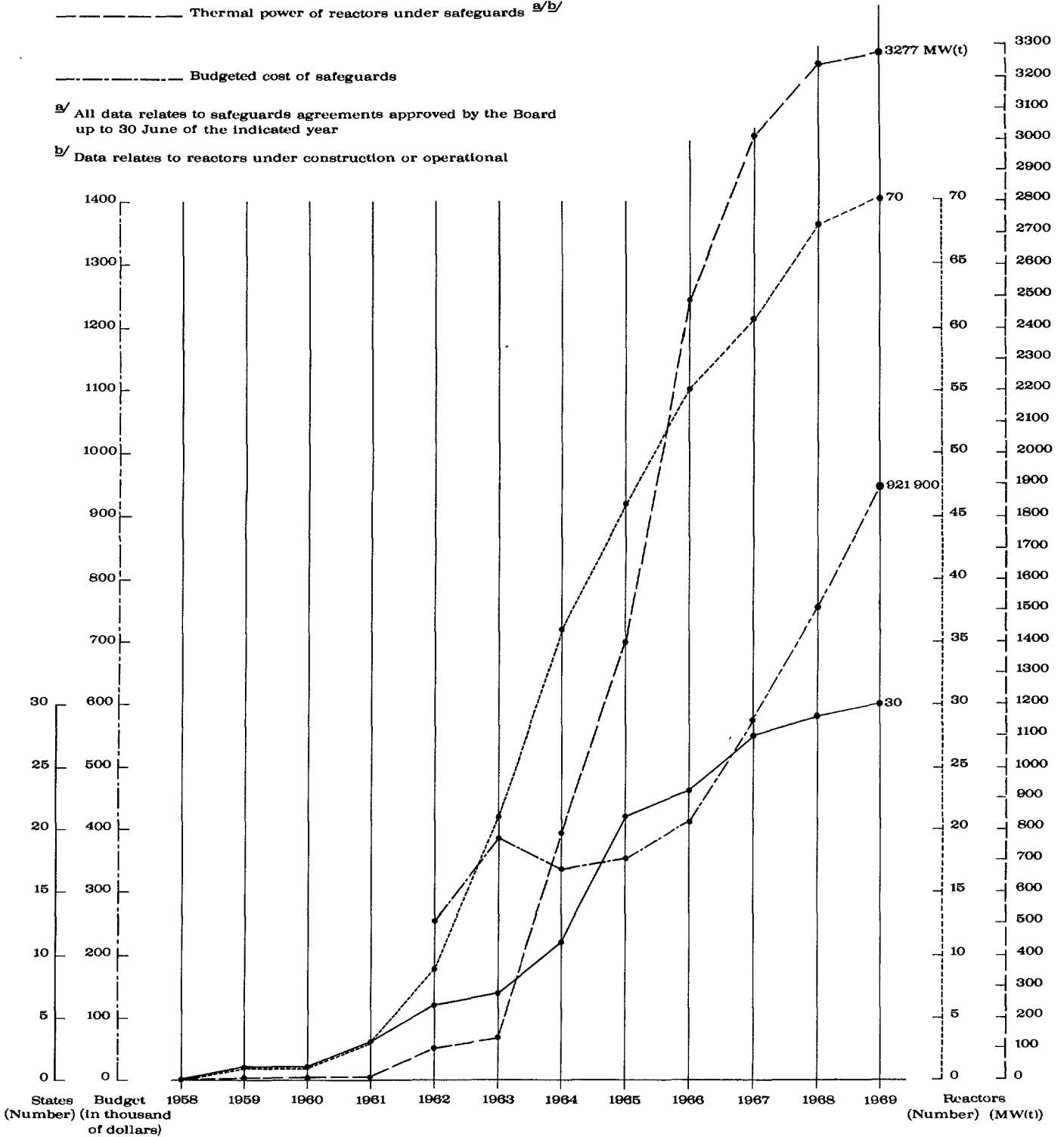
----- Number of reactors under safeguards ^{a/b/}

----- Thermal power of reactors under safeguards ^{a/b/}

----- Budgeted cost of safeguards

^{a/} All data relates to safeguards agreements approved by the Board up to 30 June of the indicated year

^{b/} Data relates to reactors under construction or operational



ADMINISTRATION

EXTERNAL RELATIONS

127. The main developments in external relations, the position taken by the Agency at the Conference of Non-Nuclear-Weapon States and at the twenty-third session of the General Assembly of the United Nations, are referred to in the Introduction and are the subject of separate reports to the General Conference. The General Conference's attention is drawn in particular to the documentation prepared by the Secretariat in regard to the recommendations of the Conference of Non-Nuclear-Weapon States [26] and to nuclear explosions for peaceful purposes [27].

128. By 30 June 1969, 90 States had signed and 16 States, including one nuclear-weapon State, had ratified the NPT. A number of these States have been in consultation with the Secretariat regarding the agreement that they will be required to conclude with the Agency pursuant to Article III of the NPT.

129. The Conference of Non-Nuclear-Weapon States has shown that closer and more effective co-operation is needed between the Secretariats of the United Nations and the Agency in matters of common interest and a number of steps have been taken to this end.

130. No serious problems of co-ordination have arisen between the Agency and the specialized agencies; on the contrary co-operation has generally been smooth and effective. Thus for the first time, WHO has joined the Agency in preparing and sponsoring recommendations on nuclear safety, namely the codes of practice for the safe operation of nuclear power plants and of research reactors and critical assemblies respectively. The relevant part of the Agency's Laboratory has become more closely integrated into servicing WHO programmes. Co-operation with UNESCO regarding the joint operation of the International Centre for Theoretical Physics at Trieste is referred to in paragraphs 12 and 62(a) above.

131. Co-operation with intergovernmental organizations has also proceeded effectively. With ENEA co-operation has continued to take place in all the subjects mentioned in last year's report [28], in various symposia, in food irradiation and in regard to thermionic conversion. Co-operation with EURATOM is referred to in paragraph 102 above.

132. During the year under review there was also an exchange of letters between the Agency and the Council for Mutual Economic Aid and between the Agency and the Joint Institute for Nuclear Research at Dubna, Soviet Union. This was to ensure closer co-operation in certain technical meetings and an increased exchange of information on matters of common interest.

PERSONNEL

133. On 30 June 1969 the Secretariat had 333 staff members in the Professional category and above. Of these, 318 held permanent or fixed-term contracts, nine were serving under Special Service Agreement and six were seconded to other United Nations organizations. 322 were employed at the Agency's Headquarters, three at Trieste, four in Monaco, two at

[26] GC(XIII)/INF/110.

[27] GC(XIII)/410.

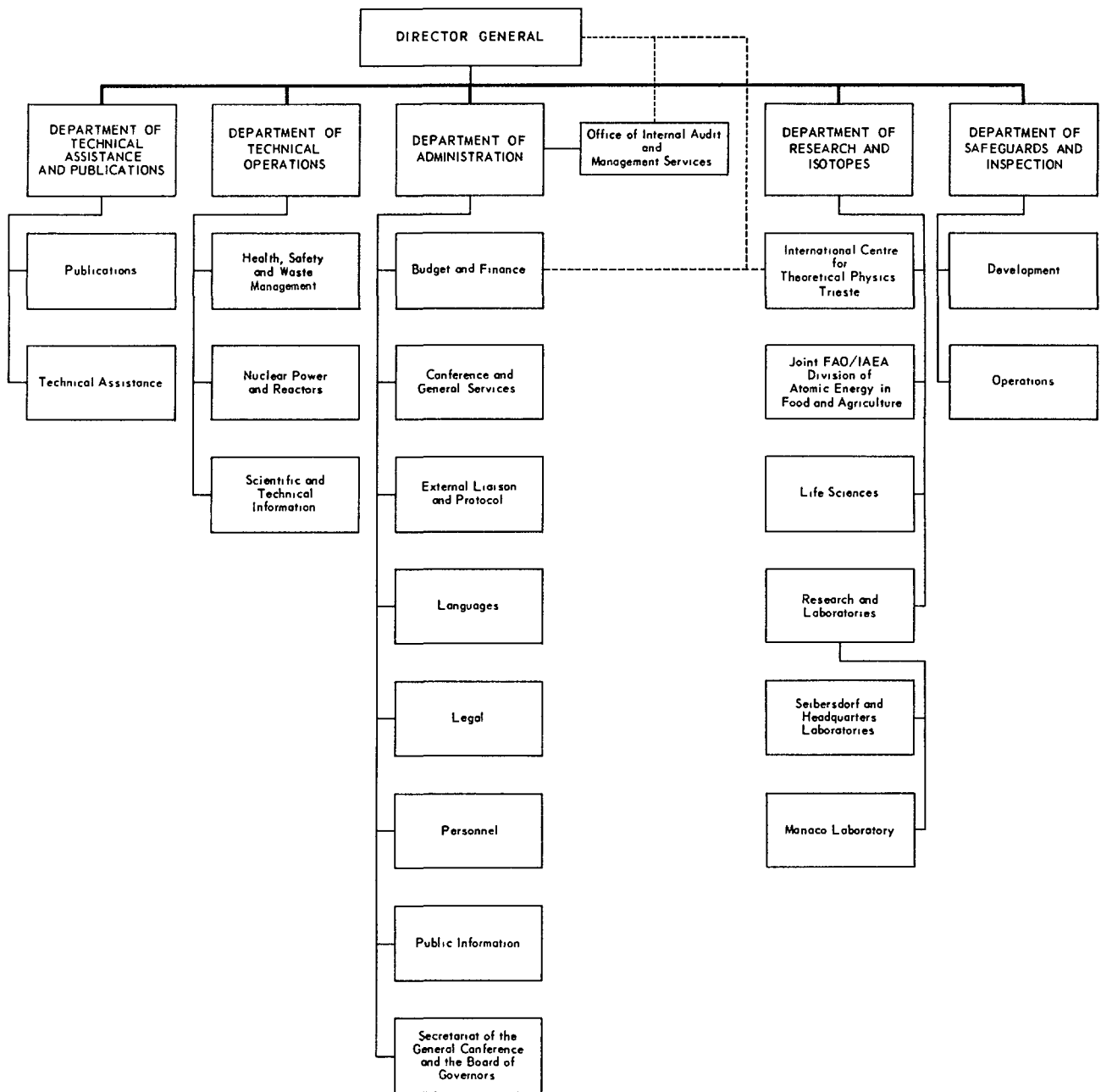
[28] GC(XII)/380, para. 134.

New York, one at Geneva and one in Bangkok. The number of staff members holding posts that were subject to geographical distribution was 275. Fifty Member States and one non-member State were represented on the staff, one member of which was stateless. The Secretariat also included 494 General Service staff, 11 of whom were serving in Monaco, 12 in Trieste, two at New York and one at Geneva, as well as 195 staff members in the Maintenance and Operatives Service. The total strength of the staff was thus 1022 [29].

134. The organizational chart below shows the structure of the Secretariat as at 30 June 1969.

[29] Details of the Agency's staff are to be found in document INFCIRC/22/Rev. 9, the Annex to which contains statistical information on staff members who held posts that were subject to geographical distribution.

Organizational Chart



FINANCE

Regular Budget

The financial year 1968

135. The assessment of contributions on Member States included in the scale of assessment for 1968 amounted to \$10 163 500. Additional assessments on Uganda, which joined the Agency in 1967 after the scale for 1968 had been established, and on one new Member (Liechtenstein) which joined in 1968, increased the total by \$8130 to \$10 171 630. In addition to the assessment to the Regular Budget for 1968, a further amount of \$240 104, representing the supplemental contribution for 1966, was assessed on Member States in 1968.

136. By 31 December 1968, the Agency received contributions towards the Regular Budget for 1968 amounting to \$9 415 395, which represents 92.57% of the total assessment; and \$223 628 towards the supplemental contribution for 1966, representing 93.14% of the total assessed for that appropriation. By 30 June 1969 \$529 480 or 93.69% of the 1968 Regular Budget assessment and \$225 475 or 93.91% of the 1966 supplemental contribution due had been received.

137. The Agency's obligations for 1968 amounted to \$10 083 330 which resulted in budgetary savings of \$393 670 from the appropriations for 1968. A further amount of \$53 520 from miscellaneous income brought the total budgetary surplus at 31 December 1968 to \$447 190 as follows:

Budgetary savings		\$ 393 670
Contributions assessed on new Member States		8 130
Excess of miscellaneous income over budget:		
Actual miscellaneous income	\$ 358 890	
Less: budget	<u>313 500</u>	<u>45 390</u>
Budgetary surplus for 1968		<u><u>\$ 447 190</u></u>

Since contributions in the amount of \$756 235 were outstanding from Member States for 1968, there was a provisional cash deficit of \$309 045.

138. Unliquidated obligations in respect of 1968 appropriations at 31 December 1968 were \$1 046 192, of which \$474 810 had been liquidated by 30 June 1969.

139. Transfers of \$57 888 were made from section 1 - The General Conference - and section 10 - Duty travel of staff - to section 2 - The Board of Governors - , section 6 - Distribution of information - and section 9 - Common staff costs - to cover increased staff emoluments. In addition, an amount of \$770 was transferred to section 11 - Representation and hospitality - to cover increased costs of hospitality, primarily in connection with scientific meetings of the Agency.

The financial year 1969

140. By 30 June 1969 the following advances to the Working Capital Fund and contributions to the Regular Budget for 1969 had been received:

Advances to the Working Capital Fund		\$ 1 980 400
Contributions to the Regular Budget for 1969		\$ 4 604 332

By that date Member States had thus paid 98.8% of the total advances due to the Working Capital Fund and 42.2% of the total contributions due to the 1969 Regular Budget.

Operational Budget

141. Although the General Conference at its eleventh (1967) regular session again established a target of \$2 million for voluntary contributions in 1968, there was a shortfall of approximately \$631 000 in the actual pledges made by Member States. Of a total amount of \$1 368 680 pledged to the General Fund for 1968, \$1 268 825 had been paid by 31 December 1968. By 30 June 1969 receipts amounted to \$1 280 945, leaving a balance of \$87 735 still to be paid.

142. The total operational obligations incurred during 1968 amounted to \$2 863 475. Unliquidated obligations as at 31 December 1968 including obligations brought forward from the previous year, amount to \$1 006 211.

The Agency's resources in 1968

143. Resources equivalent to more than \$15 300 000 were at the Agency's disposal during 1968 under its own programme, UNDP(TA) and UNDP(SF) accounts and other special projects, including contributions in cash, services and kind. Details concerning these resources are set out in the table below:

Table 22

Funds and other resources at the disposal of the Agency in 1968^{a/}

	\$	\$	\$
<u>Administrative Fund</u>			
Assessed contributions to the Regular Budget			
Member States included in the scale for 1968	10 163 500		
New Members	<u>8 130</u>	10 171 630	
Actual miscellaneous income		<u>358 890</u>	
Sub-total			10 530 520
<u>General Fund (including Operating Fund I and II)</u>			
Voluntary contributions pledged for 1968		1 366 218	
Miscellaneous income (from investments, laboratory, local costs, etc.)		401 347	
Income from the Agency/United States Atomic Energy Commission Research Programme		5 365	
Special voluntary contributions pledged		<u>294 898</u>	
Sub-total			2 067 828
<u>Special Accounts</u>			
Central Fund in Trust Technical Assistance Programme to the Democratic Republic of the Congo			14 001
<u>United Nations Development Programme</u>			
<u>Technical Assistance Account^{b/}</u>			
Obligations incurred during the year 1968 (Project costs)			1 616 948
<u>Special Fund^{c/}</u>			
Funds committed during the year 1968			313 053
<u>Financial contributions received towards the costs of conferences, symposia and seminars for 1968</u>			
Amounts pledged			58 317
<u>Contributions in services and in kind^{d/}</u>			
Type II fellowships awarded ^{e/}		532 800	
Technical assistance equipment and supplies		73 900	
Laboratory equipment and supplies		38 100	
Library, etc.		4 974	
Special nuclear materials		<u>52 301</u>	
Sub-total			702 075
TOTAL			<u>15 302 742</u>

a/ See the Agency's Accounts for 1968 (GC(XIII)/406).

b/ Ibid., Statement IX. A.

c/ Ibid., Statement X. A.

d/ Ibid., Schedule G. In addition to monetary funds, contributions in services and kind were at the Agency's disposal. Not listed since not evaluable in dollars are cost-free experts: 130 experts - 1287 man/days in 1968.

e/ Ibid., Schedule G. The amount shown represents the total value of fellowships offered during the respective year, while many of the fellowships extended over a number of years.

LEGAL MATTERS

144. Five Member States were assisted in the framing of nuclear legislation, and advice was provided to one international organization in the preparation of recommendations for the transport of radioactive materials.

145. An international symposium on third party liability and insurance in the maritime carriage of nuclear substances was held jointly by the Agency and ENEA in Monaco in October 1968, with the participation of legal experts and representatives from insurance associations, sea transport organizations and the nuclear industry. The practical measures recommended at the symposium for improving the present legal system are under consideration by the competent international organizations and professional associations and, in the light of such studies, appropriate meetings are being prepared for 1969-70.

PUBLIC INFORMATION

146. The special attention focused on the Agency by the Treaty on the Non-Proliferation of Nuclear Weapons greatly affected its public information this year. Progress reported in a large number of Agency conferences on power reactors proved of considerable interest to information media, in particular with regard to the use of nuclear power in water desalination.

147. A version in both English and French of a film "Watch on the Sea" on the International Laboratory of Marine Radioactivity in Monaco was produced. An Agency film on safeguards is being prepared and will be completed in 1969.

ANNEX A

THE BOARD OF GOVERNORS

To 30 September 1968	1968-1969	From 30 September 1968
	Algeria ^{a/}	
	Argentina ^{b/c/}	
	Australia ^{b/d/}	
		Belgium ^{e/}
	Brazil ^{d/f/}	
	Bulgaria ^{a/}	
	Canada ^{b/d/}	
	Ceylon ^{a/}	
Czechoslovak Socialist Republic ^{g/}		Finland ^{e/}
	France ^{b/d/}	
Germany, Federal Republic of ^{f/}		
	India ^{b/d/}	
Indonesia ^{f/}		Iran ^{c/}
		Italy ^{c/}
	Japan ^{b/d/}	
Lebanon ^{f/}		
	Madagascar ^{a/}	
Mexico ^{f/}		
Norway ^{g/}		
	Peru ^{a/}	
	Philippines ^{a/}	
		Poland ^{e/}
Portugal ^{g/}		Singapore ^{c/}
	South Africa ^{b/d/}	
	Turkey ^{a/}	
	Union of Soviet Socialist Republics ^{b/d/}	
	United Kingdom of Great Britain and Northern Ireland ^{b/d/}	
	United States of America ^{b/d/}	Venezuela ^{c/}

- ^{a/} Elected by the General Conference on 2 October 1967 under Article VI, A.3 of the Statute.
- ^{b/} Designated by the Board on 16 June 1967 under Article VI, A.1 of the Statute.
- ^{c/} Elected by the General Conference on 30 September 1968 under Article VI, A.3 of the Statute.
- ^{d/} Designated by the Board on 13 June 1968 under Article VI, A.1 of the Statute.
- ^{e/} Designated by the Board on 13 June 1968 under Article VI, A.2 of the Statute.
- ^{f/} Elected by the General Conference on 27 September 1966 under Article VI, A.3 of the Statute.
- ^{g/} Designated by the Board on 16 June 1967 under Article VI, A.2 of the Statute.

ANNEX B

FELLOWSHIPS OFFERED OR PROVIDED FREE OF CHARGE IN 1968

Donor	Number of fellowships	
	Offered	Utilized ^{a/}
<u>Member States</u>		
Argentina	5	3
Austria	3	2
Belgium	6	6
Brazil	10	2
China	2	-
Czechoslovak Socialist Republic	9	-
Denmark	5 ^{b/}	5
Germany, Federal Republic of	- ^{b/}	17
Hungary	4	2
India	10	12
Israel	5 ^{c/}	1
Italy	20 ^{d/}	22 ^{e/}
Japan	10	10 ^{e/}
Mexico	1	1
Netherlands	8	5
Poland	5	5
Romania	- ^{f/}	-
Spain	5	6
Sweden	2	3
Switzerland	2	1
Tunisia	2	-
Union of Soviet Socialist Republics	- ^{g/}	9 ^{h/}
United States of America	40 ^{i/}	45 ^{h/}
Yugoslavia	5 ^{i/}	4 ^{i/}
	Sub-total	159
		161
<u>Regional organizations</u>		
Joint Institute for Nuclear Research (JINR) at Dubna, Soviet Union	3 ^{k/}	1
	Total	162
		162

a/ Number of awards less rejections and withdrawals.

b/ No maximum number of openings was specified in the Government's offer.

c/ On the basis of nine man-months per fellowship; the offer was for a total of 45 man-months.

d/ On the basis of eight man-months per fellowship; the offer was for a total of 160 man-months.

e/ Two of these were used for the extension of awards of fellows studying in the host country.

- f/ Twelve openings were available in 1968, as a carry-over from the offer made in 1965.
- g/ Fourteen openings were available in 1968, as a carry-over from the offer made in 1967.
- h/ Includes awards financed out of current and prior years' savings.
- i/ On the basis of six man-months per fellowship.
- j/ All man-months available under the host country offer were utilized.
- k/ On the basis of 12 man-months per fellowship; the offer was for a total of 36 man-months.

A N N E X C

RESEARCH CONTRACTS

I. Total value of contracts in 1968

Year	New contracts	Renewals	Total	Value
1968	89	88	177	782 535

II. Analysis by subject matter of contracts awarded or renewed in 1968

Subject matter of research	Number of contracts placed	Number of contracts renewed	Agency contribution
Radioactive waste management and environemntal research	5	7	83 840
Health physics and radiation protection	3	3	24 100
Radiation biology	12	12	82 800
Studies involving reactors	12	2	73 125
Physics and chemistry	10	-	59 120
Radioisotope applications in agriculture	25	36	216 151
Food irradiation	4	9	51 300
Radioisotope applications in hydrology	3	5	41 199
Radioisotope applications in industry	2	3	20 000
Radioisotope applications in medicine	13	11	130 900
Total	89	88	782 535

III. Analysis by country of contracts awarded or renewed in 1968

Country	Number of contracts placed	Number of contracts renewed	Agency contribution
Algeria	1	-	3 500
Argentina	2	2	20 000
Australia	-	1	3 000
Austria	-	1	2 000
Belgium	3	1	14 100
Brazil	1	3	16 350
Bulgaria	2	1	21 400
Burma	1	-	2 500
Ceylon	-	1	4 000
Chile	2	1	21 650
China	6	4	41 950
Cuba	1	-	9 000
Czechoslovak Socialist Republic	2	1	19 000
Denmark	1	1	7 200
Ecuador	2	-	10 000
El Salvador	-	1	6 000
Ethiopia	1	-	6 000
Finland	2	-	12 500
France	2	-	11 300
Germany, Federal Republic of	1	1	7 500
Ghana	1	1	5 300
Greece	3	1	15 500
Hungary	-	7	30 450
India	2	3	20 500
Indonesia	1	-	2 760
Iran	1	1	10 400
Iraq	-	1	2 700
Israel	3	3	28 825
Italy	1	1	12 160
Japan	1	3	12 481
Kenya	2	2	14 550
Korea, Republic of	1	5	19 755
Lebanon	1	-	3 110
Madagascar	1	2	8 300
Malaysia	1	-	4 000
Mexico	1	-	2 900
Morocco	1	-	3 650
Netherlands	2	2	15 000
Nigeria	1	-	4 000
Pakistan	5	4	36 360
Peru	1	-	4 000
Philippines	2	5	26 200
Poland	1	2	8 950
Portugal	-	2	11 200
Romania	3	5	56 724
South Africa	2	1	12 100
Spain	2	4	26 975
Sweden	1	-	3 500
Thailand	3	3	22 050
Turkey	1	4	15 805
Uganda	1	-	4 000
Union of Soviet Socialist Republics	1	1	13 560
United Arab Republic	3	5	39 920
United Kingdom of Great Britain and Northern Ireland	1	-	3 500
Venezuela	1	-	4 000
Viet-Nam	2	-	7 200
Yugoslavia	5	1	31 200
Total	89	88	782 535

A N N E X D

CONFERENCES, SYMPOSIA AND SEMINARS HELD
DURING THE PERIOD 1 JULY 1968-30 JUNE 1969

Date and place	Title	Co-sponsoring organizations	Number of participants	Number of countries represented	Number of organizations represented	Number of papers presented
<u>1968</u>						
15-19 July Vienna	Symposium on the Use of Isotopes and Radiation in Soil Organic Matter Studies	FAO	108	31	2	48
24-30 July Warsaw	Symposium on Magnetohydrodynamic Electrical Power Generation		300	19	3	199
1-7 August Novosibirsk (Union of Soviet Socialist Republics)	Third Conference on Plasma Physics and Controlled Nuclear Fusion Research		380	20	2	123
6-15 August Salzburg (Austria)	Symposium on Medical Radioisotope Scintigraphy		341	35	5	115
7-13 August Vienna	International Symposium on Meteorite Research	UNESCO, JCAR-ICSU, IAU, IUGS, IAGC, The Meteoritical Society	149	20	6	73
26-30 August New York	Symposium on Operating and Developmental Experience in the Treatment of Airborne Radioactive Wastes		152	17	5	52
21-25 October Jülich (Federal Republic of Germany)	Symposium on Advanced and High-Temperature Gas-Cooled Reactors		357	24	7	52

Date and place	Title	Co-sponsoring organizations	Number of participants	Number of countries represented	Number of organizations represented	Number of papers presented
5-9 November Buenos Aires	Symposium on the Use of Nuclear Techniques in the Prospecting and Development of Mineral Resources	JCAR-ICSU	63	20	-	30
18-22 November Madrid	Symposium on Nuclear Desalination		274	28	8	61
9-13 December Bombay (India)	Regional Seminar for Asia and the Far East on Radiation Protection Monitoring	WHO	91	18	2	47
<u>1969</u>						
24-28 March Vienna	Seminar on Agricultural and Public Health Aspects of Environmental Contamination by Radioactive Materials	FAO, WHO	162	36	7	63
28 April-2 May Athens	Symposium on Radiation-Induced Cancer		84	23	2	36
19-23 May Vienna	Symposium on the Handling of Radiation Accidents	WHO	211	34	7	54
2-6 June Vienna	Symposium on Radiation Damage in Reactor Materials		179	26	6	57

A N N E X E

STATUS OF FINANCIAL CONTRIBUTIONS TO THE AGENCY ON 30 JUNE 1969

1. Advances to the Working Capital Fund and Contributions to the Regular Budget for 1969

(In United States dollars)

Member	Working Capital Fund			Contribution to the Regular Budget			
	Assessed	Paid	Outstanding	Assessed	Credits	Paid	Outstanding
Afghanistan	800	800	-	4 355	200	-	4 155
Albania	800	800	-	4 355	72	-	4 283
Algeria	1 800	1 800	-	9 799	161	9 619	19
Argentina	16 800	16 600	200	91 455	2 079	-	89 376
Australia	27 600	27 600	-	150 247	3 343	73 452	73 452
Austria	10 400	10 400	-	56 615	860	55 755	-
Belgium	20 000	20 000	-	108 875	2 463	106 412	-
Bolivia	800	800	-	4 355	-	-	4 355
Brazil	16 200	16 200	-	88 189	2 340	-	85 849
Bulgaria	3 200	3 000	200	17 420	269	-	17 151
Burma	1 000	1 000	-	5 444	89	-	5 355
Byelorussian Soviet Socialist Republic	9 200	9 200	-	50 082	1 042	24 520	24 520
Cambodia	800	800	-	4 355	72	-	4 283
Cameroon	800	800	-	4 355	72	4 283	-
Canada	54 800	54 800	-	298 317	7 322	290 995	-
Ceylon	1 000	1 000	-	5 444	525	4 919	-
Chile	4 200	4 200	-	22 864	1 030	-	21 834
China	72 8000	72 800	-	396 305	10 459	-	385 846
Colombia	3 600	3 600	-	19 597	976	-	18 621
Congo, Democratic Republic of	1 000	1 000	-	5 444	183	-	5 261
Costa Rica	800	800	-	4 355	72	-	4 283
Cuba	3 400	3 400	-	18 509	200	-	18 309
Cyprus	800	800	-	4 355	72	4 283	-
Czechoslovak Socialist Republic	16 800	16 800	-	91 455	4 991	-	86 464
Denmark	11 200	11 200	-	60 970	1 003	59 967	-
Dominican Republic	800	800	-	4 355	-	-	4 355
Ecuador	800	800	-	4 355	200	-	4 155
El Salvador	800	800	-	4 355	72	-	4 283
Ethiopia	800	800	-	4 355	104	-	4 251
Finland	9 000	9 000	-	48 994	698	48 296	-
France	109 000	109 000	-	593 369	10 432	582 937	-
Gabon	800	800	-	4 355	3 767	-	588
Germany, Federal Republic of	127 400	127 400	-	693 534	17 964	337 785	337 785
Ghana	1 400	1 400	-	7 621	2 563	5 058	-
Greece	5 200	4 400	800	28 308	412	-	27 896
Guatemala	1 000	800	200	5 444	-	-	5 444
Haiti	800	800	-	4 355	-	-	4 355
Holy See	800	800	-	4 355	72	4 283	-
Hungary	9 400	9 400	-	51 171	1 495	-	49 676
Iceland	800	800	-	4 355	72	4 283	-
India	31 600	31 600	-	172 022	4 791	167 231	-
Indonesia	6 200	6 200	-	33 751	1 427	-	32 324
Iran	4 000	3 600	400	21 775	322	-	21 453
Iraq	1 200	1 200	-	6 533	325	6 208	-
Israel	3 600	3 600	-	19 597	269	19 328	-

Member	Working Capital Fund			Contribution to the Regular Budget			
	Assessed	Paid	Outstanding	Assessed	Credits	Paid	Outstanding
Italy	58 800	45 800	13 000	320 092	4 101	-	315 991
Ivory Coast	800	800	-	4 355	221	4 134	-
Jamaica	1 000	1 000	-	5 444	89	5 355	-
Japan	68 600	68 600	-	373 441	4 477	368 964	-
Jordan	800	800	-	4 355	72	-	4 283
Kenya	800	800	-	4 355	72	4 283	-
Korea, Republic of	2 200	2 200	-	11 976	415	11 561	-
Kuwait	1 200	1 000	200	6 533	89	-	6 444
Lebanon	1 000	1 000	-	5 444	89	-	5 355
Liberia	800	800	-	4 355	72	-	4 283
Libya	800	800	-	4 355	72	-	4 283
Luxemburg	1 000	1 000	-	5 444	89	4 411	944
Madagascar	800	800	-	4 355	72	4 283	-
Mali	800	800	-	4 355	-	-	4 355
Mexico	15 800	14 600	1 200	86 011	1 307	-	84 704
Monaco	800	800	-	4 355	72	4 283	-
Morocco	1 800	1 800	-	9 799	379	9 354	66
Netherlands	21 000	21 000	-	114 319	1 791	112 528	-
New Zealand	6 600	6 600	-	35 929	809	35 120	-
Nicaragua	800	800	-	4 355	-	-	4 355
Nigeria	2 600	2 600	-	14 154	669	-	13 485
Norway	7 800	7 800	-	42 461	916	41 545	-
Pakistan	6 800	6 800	-	37 018	591	18 114	18 313
Panama	800	800	-	4 355	72	-	4 283
Paraguay	800	-	800	4 355	-	-	4 355
Peru	1 800	1 600	200	9 799	-	-	9 799
Philippines	6 200	6 200	-	33 751	555	33 196	-
Poland	26 800	26 800	-	145 892	2 346	71 773	71 773
Portugal	3 000	3 000	-	16 331	251	16 080	-
Romania	6 600	6 600	-	35 929	555	17 775	17 599
Saudi Arabia	1 000	1 000	-	5 444	307	5 137	-
Senegal	800	800	-	4 355	72	-	4 238
Sierra Leone	800	-	800	4 355	-	-	4 355
Singapore	1 000	1 000	-	5 444	-	5 444	-
South Africa	9 400	9 400	-	51 171	842	50 329	-
Spain	16 800	13 200	3 600	91 455	1 182	-	90 273
Sudan	1 000	1 000	-	5 444	89	-	5 355
Sweden	22 800	22 800	-	124 117	2 042	122 075	-
Switzerland	15 600	15 600	-	84 922	1 615	83 307	-
Syrian Arab Republic	800	800	-	4 355	289	-	4 066
Thailand	2 400	2 400	-	13 065	433	12 632	-
Tunisia	800	800	-	4 355	289	-	4 066
Turkey	6 400	6 400	-	34 840	555	34 285	-
Uganda	800	-	800	4 355	-	-	4 355
Ukrainian Soviet Socialist Republic	35 000	35 000	-	190 531	3 570	93 480	93 481
Union of Soviet Socialist Republics	265 600	265 600	-	1 445 860	27 070	709 394	709 396
United Arab Republic	3 600	3 600	-	19 597	976	-	18 621
United Kingdom of Great Britain and Northern Ireland	120 400	120 400	-	655 427	21 041	634 386	-
United States of America	631 400	631 400	-	3 437 184	62 949	-	3 374 235
Uruguay	1 600	1 600	-	8 710	200	-	8 510

Member	Working Capital Fund			Contribution to the Regular Budget			
	Assessed	Paid	Outstanding	Assessed	Credits	Paid	Outstanding
Venezuela	8 200	8 200	-	44 639	1 606	-	43 033
Viet-Nam	1 200	1 200	-	6 533	325	6 208	-
Yugoslavia	7 200	7 200	-	39 195	606	28 858	9 731
Sub-total	2 000 000	1 977 600	22 400	10 887 500	231 181	4 357 908	6 298 411
Liechtenstein (New Member: 13 Dec. 1968)	800	800	-	4 355	-	4 355	-
Malaysia (New Member: 15 Jan. 1969)	2 000	2 000	-	10 888	-	10 888	-
Niger (New Member: 27 Mar. 1969)	800	-	800	4 355	-	-	4 355
Zambia (New Member: 8 Jan. 1969)	800	-	800	4 355	-	-	4 355
Sub-total	4 400	2 800	1 600	23 953	-	15 243	8 710
TOTALS	2 004 400	1 980 400	24 000	10 911 453	231 181	4 373 151	6 307 121

2. Outstanding contributions to the Regular Budgets for the years 1958-1968

(In United States dollars)

	1958-1959	1950	1961	1962	1963	1964	1965	1966		1967	1968	Total
								Original Assessment	Supplementary Assessment			
Afghanistan	-	-	-	-	-	3 343	3 857	4 213	120	4 587	5 982	21 202
Bolivia	-	-	-	-	-	-	-	3 019	96	3 670	4 040	10 825
Burma	-	-	-	-	-	-	-	-	120	-	-	120
Cambodia	-	-	-	-	-	-	-	-	96	3 532	4 040	7 668
Chile	-	-	-	-	-	-	-	-	-	-	20 209	20 209
China	-	-	-	-	-	-	-	-	9 184	343 931	385 578	738 693
Costa Rica	-	-	-	-	-	-	-	-	96	3 670	4 040	7 806
Cuba	-	-	-	-	-	-	-	-	432	10 775	18 167	29 374
Dominican Republic	-	-	-	3 015	3 561	3 610	3 857	3 371	96	3 670	4 065	25 245
Ecuador	-	-	-	-	-	-	-	160	120	4 587	5 082	9 949
El Salvador	-	-	-	-	-	-	-	-	96	3 532	4 040	7 658
Guatemala	-	-	-	-	-	-	2 046	3 371	96	3 670	4 065	13 248
Haiti	2 021 <u>a/</u>	2 337	2 467	2 652	2 849	2 888	3 085	3 371	96	3 670	4 065	29 501
Honduras <u>b/</u>	-	-	-	-	-	2 020	3 085	3 371	96	3 670	-	12 242
Hungary	-	-	-	-	-	-	-	-	1 199	36 272	550 519	87 990
Indonesia	-	-	-	-	-	-	-	-	839	-	35 311	36 150
Iran	-	-	-	-	-	-	-	-	432	2 630	18 179	21 241
Jordan	-	-	-	-	-	-	-	-	-	-	72	72
Liberia	-	-	-	-	-	-	-	-	96	-	4 040	4 136
Mali	-	-	-	-	-	-	-	2 949	96	3 670	4 065	10 760
Nicaragua	-	-	-	-	-	-	-	-	96	2 392	4 040	6 528
Panama	-	-	-	-	-	-	-	-	-	-	3 660	3 660
Paraguay	3 726 <u>c/</u>	2 337	2 467	2 652	2 849	2 888	3 085	3 371	96	3 670	4 065	31 206
Peru	-	-	-	-	-	-	-	-	192	5 245	8 074	13 511
Senegal	-	-	-	-	-	-	-	-	-	-	3 334	3 334
Sierra Leone	-	-	-	-	-	-	-	-	-	3 670	4 065	7 735
Sudan	-	-	-	-	-	-	-	-	120	-	5 044	5 164
Tunisia	-	-	-	-	-	-	-	-	-	-	800	800
Uganda	-	-	-	-	-	-	-	-	-	3 670	4 065	7 735
United Arab Republic	-	-	-	-	-	-	-	-	503	-	21 197	21 700
Uruguay	-	-	-	-	-	-	-	4 943	216	8 256	9 147	22 562
Total outstanding	5 747	4 674	4 934	8 319	9 259	14 749	19 015	32 1391	14 629	462 439	642 150	1 218 054
Total paid	9 334 013	5 876 306	6 195 756	6 631 760	7 146 004	7 215 525	7 213 267	8 405 316	225 475	8 722 571	9 529 480	76 495 473
Total assessments	9 339 760	5 880 980	6 200 690	6 640 079	7 155 263	7 230 274	7 232 282	8 437 455	240 104	9 185 010	10 171 630	77 713 527
Percentage of assessments paid	99.94	99.92	99.92	99.87	99.87	99.80	99.74	99.62	93.91	94.97	93.69	98.43

a/ Payable towards the Regular Budget for 1959.

b/ Withdrew from membership on 19 June 1967.

c/ Of this amount, \$ 1636 are payable towards the Regular Budget for 1958 and \$2 090 towards the Regular Budget for 1959.

3. Voluntary contributions to the General Fund for 1968 and 1969

(Expressed in United States dollars at the rate of exchange used for the United Nations Development Programme)

	1968			1969		
	Pledged	Paid	Outstanding	Pledged	Paid	Outstanding
Argentina	16 600 <u>a/</u>	16 600	-	16 800 <u>a/</u>	-	16 800
Australia	28 400 <u>a/</u>	23 352	5 048	28 400 <u>a/</u>	20 000	8 400
Austria	9 600 <u>a/</u>	9 600	-	10 400 <u>a/</u>	10 400	-
Belgium	10 000	10 000	-	-	-	-
Brazil	17 000 <u>a/</u>	17 000	-	16 200 <u>a/</u>	-	16 200
Bulgaria	2 500	2 500	-	2 200 <u>a/</u>	-	3 200
Burma	1 000 <u>a/</u>	1 000	-	1 000 <u>a/</u>	-	1 000
Cambodia	800 <u>a/</u>	-	800	-	-	-
Canada	57 000 <u>a/</u>	57 000	-	57 000 <u>a/</u>	-	57 000
Ceylon	2 100 <u>a/</u>	2 100	-	2 623 <u>a/</u>	2 100	523
Chile	5 000 <u>a/</u>	-	5 000	-	-	-
China	10 000	-	10 000	10 000	-	10 000
Colombia	2 000	2 000	-	2 000	2 000	-
Congo, Democratic Republic of	1 000 <u>a/</u>	1 000	-	1 000 <u>a/</u>	-	1 000
Cyprus	800 <u>a/</u>	800	-	800 <u>a/</u>	800	-
Czechoslovak Socialist Republic	20 833 <u>a/</u>	20 833	-	20 833 <u>a/</u>	-	20 833
Denmark	11 200 <u>a/</u>	11 200	-	11 200 <u>a/</u>	11 200	-
Finland	12 000 <u>a/</u>	12 000	-	9 000 <u>a/</u>	9 000	-
France	30 612	30 612	-	30 364	30 364	-
Germany, Federal Republic of	133 400 <u>a/</u>	133 400	-	127 400 <u>a/</u>	63 700	63 700
Ghana	1 400 <u>a/</u>	1 400	-	1 800 <u>a/</u>	1 800	-
Greece	4 400 <u>a/</u>	4 400	-	5 200 <u>a/</u>	-	5 200
Holy See	2 000 <u>a/</u>	2 000	-	2 000 <u>a/</u>	2 000	-
Hungary	3 333	3 333	-	6 667 <u>a/</u>	-	6 667
Iceland	800 <u>a/</u>	800	-	800 <u>a/</u>	800	-
India	35 000 <u>a/</u>	35 000	-	35 000 <u>a/</u>	35 000	-
Indonesia	3 000	3 000	-	6 200 <u>a/</u>	-	6 200
Iran	2 000	-	2 000	3 600	-	3 600
Iraq	1 400 <u>a/</u>	1 400	-	1 400 <u>a/</u>	1 400	-
Israel	3 000 <u>a/</u>	3 000	-	3 600 <u>a/</u>	3 600	-
Ivory Coast	803 <u>a/</u>	803	-	800 <u>a/</u>	800	-
Japan	49 800 <u>a/</u>	49 800	-	60 000	60 000	-
Korea, Republic of	2 400 <u>a/</u>	2 400	-	2 200 <u>a/</u>	2 200	-
Kuwait	1 500 <u>a/</u>	1 000	500	3 000 <u>a/</u>	-	3 000
Lebanon	1 000 <u>a/</u>	1 000	-	-	-	-
Madagascar	800 <u>a/</u>	800	-	800 <u>a/</u>	778	22
Mexico	16 500 <u>a/</u>	-	16 500	14 700	-	14 700
Monaco	2 000 <u>a/</u>	2 000	-	2 000 <u>a/</u>	2 000	-
Morocco	2 000 <u>a/</u>	2 000	-	-	-	-
Netherlands	20 000 <u>a/</u>	20 000	-	21 000 <u>a/</u>	21 000	-
New Zealand	6 800 <u>a/</u>	6 800	-	6 600 <u>a/</u>	6 600	-
Norway	8 000 <u>a/</u>	8 000	-	7 800 <u>a/</u>	7 800	-
Pakistan	6 000	6 000	-	6 000	6 000	-
Peru	1 600 <u>a/</u>	1 600	-	-	-	-
Philippines	6 200 <u>a/</u>	6 200	-	6 200 <u>a/</u>	6 200	-
Poland	6 250	6 250	-	6 250	6 250	-
Portugal	3 600 <u>a/</u>	3 600	-	3 600 <u>a/</u>	3 600	-
Romania	6 200 <u>a/</u>	6 200	-	8 250 <u>a/</u>	8 250	-
Saudi Arabia	1 200 <u>a/</u>	1 200	-	1 200 <u>a/</u>	1 200	-
Singapore	800 <u>a/</u>	800	-	1 000 <u>a/</u>	1 000	-

	1968			1969		
	Pledged	Paid	Outstanding	Pledged	Paid	Outstanding
South Africa	9 400 <u>a/</u>	9 400	-	9 400 <u>a/</u>	-	9 400
Spain	10 000	10 000	-	10 000	-	10 000
Sweden	22 600 <u>a/</u>	22 600	-	22 800 <u>a/</u>	22 800	-
Switzerland	15 800 <u>a/</u>	15 800	-	15 600 <u>a/</u>	15 600	-
Thailand	3 000 <u>a/</u>	3 000	-	3 000 <u>a/</u>	3 000	-
Tunisia	-	-	-	1 000 <u>a/</u>	-	1 000
Turkey	6 200 <u>a/</u>	6 200	-	6 400 <u>a/</u>	-	6 400
Uganda	-	-	-	1 000 <u>a/</u>	-	1 000
Union of Soviet Socialist Republics	111 111	111 111	-	166 667	166 667	-
United Arab Republic	11 500 <u>a/</u>	11 500	-	11 500 <u>a/</u>	-	11 500
United Kingdom of Great Britain and Northern Ireland	110 000	110 000	-	110 000	110 000	-
Uruguay	-	-	-	2 000 <u>a/</u>	-	2 000
Venezuela	9 000 <u>a/</u>	-	9 000	8 200 <u>a/</u>	-	8 200
Viet-Nam	1 400 <u>a/</u>	1 400	-	1 200 <u>a/</u>	1 200	-
Yugoslavia	8 000 <u>a/</u>	8 000	-	8 000 <u>a/</u>	-	8 000
Sub-total	889 642	840 794	48 848	942 654	647 109	295 545
United States of America (including matching contribution)	479 038 <u>bc/</u>	440 151	38 887	453 870 <u>bd/</u>	-	453 870
TOTAL	1 368 680	1 280 945	87 735	1 396 524	647 109	749 415

a/ Pledge equals or exceeds the percentage of the target of \$2 million set for voluntary contribution for 1968 or 1969 (see General Conference Resolutions GC(XI)/RES/227, para. 1 and GC(XII)/RES/243, para. 1 respectively) which is equal to the Member's percentage assessment under the Regular Budget for the same year (see Resolutions GC(XI)/RES/229 and GC(XII)/RES/246).

b/ When making this pledge, the United States also pledged itself to make contributions in kind in the form of cost-free experts, equipment for technical assistance, laboratory equipment, special nuclear materials and Type II fellowships, to a total value of approximately \$400 000 in the year in question. It is to be noted that other Members as well contribute to the Agency's resources in this way, and information relating to all such contributions made in 1968 is provided in the Agency's accounts for last year (GC(XIII)/406, Part IV, Schedule G).

c/ The United States pledged an amount equal to 35% of all contributions for 1968 that are paid by the end of 1969, up to a percentage of the target equal to its percentage assessment under the Regular Budget for 1968.

d/ The United States pledged an amount equal to 32.5% of all contributions for 1969 that are paid by the end of 1970, up to a percentage of the target equal to its percentage assessment under the Regular Budget for 1969.

