

International Atomic Energy Agency

ANNUAL REPORT  
OF THE  
BOARD OF GOVERNORS  
TO THE  
GENERAL CONFERENCE

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List of abbreviations

Agency	International Atomic Energy Agency
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
IANEC	Inter-American Nuclear Energy Commission (of the Organization of American States)
IATA	International Air Transport Association
ICSU	International Council of Scientific Unions
IHD	International Hydrological Decade
ILO	International Labour Organisation
INIS	International Nuclear Information System
JCAR	Joint Commission of Applied Radioactivity
UNDP/TA	United Nations Development Programme/Technical Assistance
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WHO	World Health Organization
WMO	World Meteorological Organization

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NOTE

All sums of money are expressed in United States dollars.

## INTRODUCTION

1. The Board of Governors presents the following report to the General Conference on the Agency's work from 1 July 1967 to 30 June 1968.
2. At the outset the Board invites the Conference's particular attention to an important event that occurred on 12 June 1968, when the General Assembly of the United Nations adopted a resolution commending the Treaty on the Non-Proliferation of Nuclear Weapons. The Agency's readiness to accept the safeguards responsibilities that the Treaty confers upon it had already been affirmed last year by the President of the General Conference [1], and was communicated to the General Assembly on 5 December 1967 by the Director General when presenting the Agency's annual report for 1966-67.
3. A further notable development has been the action taken by the Government of Mexico in requesting the Agency to apply its safeguards to all nuclear activities in Mexico, pursuant to Article III, A, 5 of the Statute and Article 13 of the Treaty for the Prohibition of Nuclear Weapons in Latin America. This is the first time that the Agency has been asked to apply safeguards to all nuclear activities in a Member State. In June the Board accordingly approved an agreement between the Agency and Mexico whereby the Agency will undertake to apply its safeguards to material, equipment and nuclear facilities in Mexico to ensure that they will not be used in such a way as to further any military purpose.
4. Independently of these developments, the Agency's safeguards activities have continued to expand with the coming into force of a number of agreements and the conclusion of new ones. As a consequence, all Member States in Latin America and in the regions of the Far East, South East Asia and the Pacific that have reactor programmes have now concluded safeguards agreements with the Agency. To enable the safeguards system itself to cover all stages in the nuclear fuel cycle, the Board has now approved special provisions dealing the plants that fabricate nuclear fuel or convert concentrates into fuel which will complement those already approved for reactors of all sizes and plants for reprocessing irradiated fuel. The first inspection of a chemical reprocessing plant was carried out in August and September 1967. Several Member States are undertaking extensive research on means to improve and simplify safeguards techniques, and the Agency is encouraging them in this work and following it closely.
5. Orders placed for new nuclear plants in 1967 totalled about 35 000 MW(e), confirming the growing role of nuclear power in meeting the world's needs for electric energy. While most of the new plants were ordered in industrially advanced countries, some will also be built in developing countries in South and South East Asia and in Latin America (Argentina), where the first order was placed in January 1968. These trends are stimulating more interest in questions of reactor siting a management of nuclear waste. The operators and potential builders of nuclear plants are immediately concerned with obtaining information about the experience being gained with the existing reactor systems. The accelerated commitment of proven nuclear fuel reserves stimulates both the exploration for new sources of nuclear fuel as well as the development of more efficient fuel utilization through advanced types of reactors (converters and breeders). The Agency's programme is therefore giving increasing attention to these subjects, and they will also be discussed at the Fourth International Conference on the Peaceful uses of Atomic Energy which the General Assembly has decided to convene "with the fullest possible participation of the Agency" in 1970 or 1971. The concept of the "energy centre" [2] is also receiving more attention.

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[1] GC(XI)/OR.118, para. 29.

[2] See para. 39 below.

6. The Agency's joint work with FAO has continued broadly on the same lines as last year. A further demonstration of the effectiveness of the sterile-male technique in controlling and eradicating insect pests has been given; encouraging results have been obtained with radiation-induced mutants of wheat and rice; and more attention is being given to the legislative and wholesomeness aspects of food irradiation.

7. In the medical and biological field, the Agency is giving increasing advice and support to WHO regarding the use of nuclear science techniques in a wide range of medical and health problems, and co-operation between the two organizations is developing very satisfactorily in regard to the health and safety responsibilities of the Agency as well as in the medical and biological programmes.

8. In the field of physical sciences, the Agency's programme for promoting the exchange of nuclear data is now soundly established under the guidance of the International Nuclear Data Committee, which held its first meeting in May 1968. The Italian Government has approved the new agreement for the International Centre for Theoretical Physics at Trieste [ 3 ], and there have been indications that UNESCO will be prepared to support the Centre on the same basis as the Agency and under a jointly operated programme from 1970 onwards.

9. With the help of experts lent by Member States and EURATOM the Agency is carrying out a detailed study of the entire INIS system which may permit it to start operating on a small scale in 1970. The microfiche clearing-house component of the system came into operation at the end of 1967.

10. The inadequacy of resources for the Agency's regular programme of technical assistance is a cause of growing concern. The target for voluntary contributions has been constant at \$2 million for several years despite steadily rising costs and increasing demands on the programme. Contributions have never reached more than 75% of this target. In 1959 the Agency could meet nearly 90% of Member States' requests for experts and equipment, in 1962 only 50%, and in 1968 it will be able to meet less than 30%. There would thus be excellent grounds for increasing substantially the Agency's technical assistance budget, but it would hardly be realistic to do so until Members are willing to make sufficient contributions to meet the present inadequate target.

11. The Director General has informed the Board that the host Government has requested a group of leading Austrian architects to prepare specifications that will be used in an international architectural competition for the design of the new headquarters of the Agency and UNIDO at the Donaupark. The Agency and UNIDO are co-operating in several administrative and personnel services and in arrangements for meeting the requirements for office accommodation in the years before the new headquarters is completed.

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[ 3 ] GC(XI)/355, para. 7.



## TECHNICAL ASSISTANCE

12. A comprehensive report on the technical assistance provided by the Agency in 1967 is being submitted separately. [ 4 ] Accordingly, this section will deal chiefly with a comparison of the 1967 and 1968 programmes and with the trends in the programmes as a whole.

Technical assistance financed from all available sources (regular programme, including assistance in kind, e.g. Type II fellowships, and the technical assistance component of UNDP)

13. Table 1 below shows the variations between the 1967 and 1968 programmes.

Table 1

### Technical assistance activities

Type or description of assistance	1967 (provided)	1968 (planned)
Number of experts and visiting professors	172	160
Number of expert man-months	500	671
Value of equipment provided (in dollars)	\$ 519 500	\$ 646 700
Number of countries receiving both experts and equipment	37	46
Number of training courses, study tours, etc.	13 <sup>a/</sup>	10 <sup>b/</sup>
Total attendance at training courses	159 <sup>c/</sup>	140 <sup>c/</sup>
Average length of participation in training courses/study tours (in months)	1.2	2.0
Number of visiting seminars	-	3
Average participation in each visiting seminar	-	150
Total fellowships awarded (including Types I, II and UNDP/TA)	269	260-280
Average length of fellowship award (in months)	9.6	9.5

a/ One survey and 12 training courses.

b/ Nine training courses and one radiation protection study tour.

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

### Experts' services and equipment under the Agency's regular programme

14. The following table relates only to the Agency's regular programme and shows the differences between 1967 and 1968 in the number and value of requests made by Governments for experts' services and equipment and the value of requests that the Board approved:

[ 4 ] GC(XII)/INF/100.

Table 2  
Requests for experts' services and equipment

Description	1967	1968
Total value of requests received	ca. \$2.6 million	ca. \$3.6 million
Total value of requests approved	\$975 000	\$977 000
Number of requests approved	62	63
Number of recipient countries	37	42
Average cost of approved project	\$15 750	\$15 500

15. A further 51 requests for assistance under the regular programme in 1968 were found to be technically sound but could not be met for lack of funds. These requests emanated from 28 countries and their average cost was \$22 100; however, of these 28 countries 26 will be among the 42 countries referred to in the table above, which are recipients under the approved programme. The Director General has brought to the attention of developed Member States those requests that could not be met for lack of funds and has asked them to consider the possibility of assisting these projects on a bilateral basis.

Trends in the regular programme since 1962

16. The extent to which the Agency has been able to meet the requests made for experts' services and equipment, under its regular programme, since 1962, is shown in Table 3 below:

Table 3  
Agency's regular programme 1962-1968

Year	Amount approved for experts and equipment (in dollars)	Number of approved requests	Number of recipient countries	Average cost of approved requests (in dollars)
	\$			\$
1962	757 550	44	25	17 200
1963	857 750	54	27	15 900
1964	804 600	55	32	14 650
1965	874 000	60	34	14 550
1966	901 600	60	40	15 050
1967	975 000	62	37	15 750
1968	977 000	63	42	15 500

17. As the General Conference is aware, the target for voluntary contributions to the General Fund remained unchanged at \$2 million during these years; it was, however, never reached. During the same period, the requests made for experts and equipment rose from \$1 530 000 in 1962 to approximately \$3 600 000 in 1968.

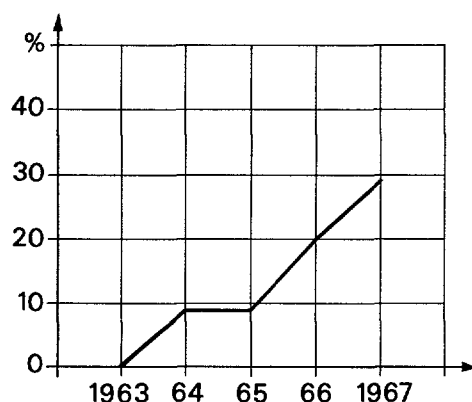
18. Table 4 and the Figure below show the steady rise, amounting to about 30%, in the cost per man-month of expert services between 1963 and 1967. The table is based on costs of projects under the technical assistance component of UNDP as well as under the Agency's regular programme.

Table 4  
Assignments of experts and visiting professors

Year	Number of experts and visiting professors	Man-months	Cost <sup>a/</sup> (in dollars)	Average cost per man-month (in dollars)
			\$	\$
1963	160	548	739 500	1350
1964	178	672	991 500	1475
1965	155	570	836 600	1470
1966	201	580	939 500	1620
1967	172	500	870 800	1740

a/ Includes payments made in respect of current and prior years' obligations and the estimated value of assistance in kind (free and part-free experts).

Average increase in cost per man-month



(1963=100)

19. The inclusion of data on visiting professors - i.e. chiefly lecturers on short-term training courses - in Table 4 reduces the average length of assignments. However, if account is taken only of experts, the average length of assignment per approved project under the Agency's regular programme amounted to 8.5 months in 1962 and fell to about five months in 1968.

20. The conclusions that can be drawn from the foregoing are that during the period 1962-1968 rising costs of experts' services have largely, and perhaps entirely, nullified the increases in the amounts approved for the services of experts and equipment under the Agency's regular programme. While the number of requests approved has increased, the average duration of an expert's visit has fallen by approximately 40%.

Separate analyses have shown that the value of equipment provided for the average project has risen slightly in financial terms during the same period, but that this rise has also been more than offset by increasing costs.

### Training

21. Integrated programming has made it possible to put fellowship training at the centre of the technical assistance programme. On the other hand, the total number of fellowships awarded to individual countries has levelled off during the last three years. This probably reflects the fact that as nuclear programmes advance, scientists in the intermediate group of developing countries are moving into more responsible positions and that fewer of them are being nominated for study abroad. To help this growing group, the members of which can seldom be spared from their duties for more than 3-4 months at a time, the Agency's programme is giving more emphasis to advanced and intensified short-term training courses, study tours for high-level personnel and better opportunities for post-graduate research.

22. Of the 269 fellowships of all kinds awarded in 1967, 49 (or 18.2%) were extensions of previous awards, as compared with 16.2% in 1966. Table 5 below shows that there was less interest in international projects in 1967.

Table 5

Distribution of Type I, Type II and UNDP/TA fellowship awards

Country programme awards	1966	1967
Individual projects	238	235
Co-operative international projects	45	34
Total awards	283	269

23. A list of fellowships offered or provided as assistance in kind (Type II awards) by Member States in 1967 is given in Annex B.

24. During the period covered by this report, nine scientists from six countries received awards for scientific visits, and nine visiting professors were assigned to developing countries. Listed below in Table 6 are the 19 regional and inter-regional training projects (one survey course, 15 training courses, two visiting seminars and one study tour) that were carried out in 17 countries and in which 267 participants from abroad and 416 from the host country took part. Two of these projects were financed by FAO and 12 by UNDP/TA.

Table 6

## Regional and inter-regional training projects

Title	Place and dates	Participation <sup>a/</sup> (1) + (2) + (3)			Lecturers	
					Outside	Agency's staff
Regional training course on the application of radioisotopes <sup>b/</sup>	Cairo, Middle Eastern Regional Radioisotope Centre for the Arab Countries 1 April to 31 July 1967	10	-	10	-	3
International training course on food irradiation technology and techniques	Michigan, United States of America 19 June to 11 August 1967	19	1	-	-	1
Regional training course on radiation immunology	Buenos Aires 4 September to 27 October 1967	11	-	7	5	1
Advanced training course on radioactive waste management <sup>b/</sup>	Oxford, United Kingdom 11 to 22 September 1967	15	15	5	3	1
Regional training course on planning for the handling of radiation accidents	Manila 2 to 13 October 1967	10	4	10	5 <sup>c/</sup>	2
International training course on the use of radioisotopes and radiation in entomology <sup>d/</sup>	Florida, United States of America 2 October to 24 November 1967	16	-	-	2	1
Inter-regional training course on the use of radioisotopes and radiation in animal science and veterinary medicine <sup>d/</sup>	Brno, Czechoslovak Socialist Republic 2 October to 11 November 1967	10	-	6	1	5
International advanced training course in bio-assay methods	Seibersdorf, Austria 30 October to 1 November 1967	10	3	-	2	5
Regional advanced training course on the medical application of radioisotopes <sup>b/</sup>	Montevideo, Uruguay 6 November to 1 December 1967	12	3	9	7	4

Title	Place and dates	Participation <sup>a/</sup> (1) + (2) + (3)			Lecturers	
					Outside	Agency's staff
Regional survey course on prospects and problems of nuclear power applications in developing countries <sup>b/</sup>	Santiago, Chile 4 to 8 December 1967	14	1	14	7 <sup>e/</sup>	2
Advanced training course on the physics of radiotherapy	London 5 February to 5 July 1968	14	-	-	-	2
Visiting seminar on personnel, area and environmental monitoring in radiation protection <sup>b/</sup>	Latin America 10 March to 11 April 1968	-	-	175	1	2
Study tour in radiation protection <sup>b/</sup>	Czechoslovak Socialist Republic, Poland and the Soviet Union 29 March to 4 May 1968	14	-	-	-	2
Regional training course on the applications of radioisotopes <sup>b/</sup>	Cairo, Middle Eastern Regional Radioisotope Centre for the Arab Countries 1 April to 31 July 1968	11	-	10	-	3
Inter-regional training course on maintenance of nuclear electronic equipment <sup>b/</sup>	Turin, Italy 1 April to 30 June 1968	16	-	-	8	1
International training course on legal aspects of the utilization of atomic energy	Vienna 16 to 26 April 1968	21	14	-	13 <sup>f/</sup>	16
Visiting seminar in safety aspects of reactor siting, design and operation	Latin America 1 to 21 May 1968	-	-	164	2	2
Inter-regional training course on radioisotope techniques in medicine <sup>b/</sup>	Moscow 3 June to 16 August 1968	10	-	-	-	1

Title	Place and dates	Participation <sup>a/</sup> (1) + (2) + (3)	Lecturers	
			Outside	Agency's staff
Inter-regional advanced training course on medical applications of radioisotopes <sup>b/</sup>	Sinaia, Romania 17 June to 12 July 1968	13 - 6	6	4

a/ (1) Denotes fellowship awards;  
(2) Participants who attended at the expense of the Government or of another organization; and  
(3) Indicates the number of local participants who attended at no cost to the project.

b/ Financed under UNDP/TA.

c/ One lecturer provided by WHO.

d/ Financed out of FAO funds.

e/ Plus three cost-free lecturers provided by the United States. In addition, three staff members from ECLA and one from IANEC presented papers.

f/ Seven of whom were provided cost-free.

#### UNDP Special Fund activities

25. The progress made in the regional project in Central America on the eradication of the Mediterranean fruit fly by the use of the sterile-male technique is referred to elsewhere in this report. [ 5 ]

26. During 1967 there was a further increase in the services that the Agency gives as sub-contractor to other United Nations organizations carrying out Special Fund projects. The sub-contractual arrangements involved six projects in five countries and one regional project in Africa (five with FAO and one with the United Nations) and the total value of the sub-contracts was approximately \$17 000. Most of the services consisted of water analyses for water resource development projects but, in some cases, short-term advisory missions were arranged. It is expected that the volume of the Agency's specialized technical services to other Executing Agencies will continue to increase in the years ahead.

27. In January 1968 the Governing Council of UNDP approved a Special Fund project on nuclear research in agriculture in India, for which the Agency is the Executing Agency. The objective of the project is to make a major contribution to increasing food production in India by using nuclear research techniques in support of intensive research employing more conventional methods. UNDP's contribution to the cost of the project will be \$1 419 700, whereas India is contributing \$1 908 000.

28. The research programme, in some ways similar to the earlier UNDP/SF project in Yugoslavia, but on a considerably larger scale, involves the establishment of a new nuclear research laboratory at the Indian Agricultural Research Institute which will be concerned with soil fertility, plant nutrition and mutation breeding. Complementary research in radiation-induced mutations and the sterile-male technique will be undertaken at the Bhabha Atomic Research Centre, while the Indian Veterinary Research Institute and the National Dairy Research Institute will carry out studies on the pathology, physiology and nutrition of farm animals.

[ 5 ] See para. 49 below.

## NUCLEAR POWER AND REACTORS

29. The forecasts made last year that the world's nuclear generating capacity would reach 30 000 MW(e) by 1970, 110 000 MW(e) in 1975 and more than 300 000 MW(e) in 1980 continue to appear realistic. Approximately 1800 MW(e) became critical in 1967 and the total capacity in operation by the end of the year thus rose to 10 600 MW(e). Another 3500 MW(e) is expected to go "on-line" in 1968. During 1967 new orders amounted to 35 000 MW(e). Most of this will be built in a few industrialized countries; however, a number of developing countries are turning to nuclear power to meet part of their future electricity needs [ 6 ].

30. The Agency's programme continues to stress practical services to Member States in economic studies, siting and safety, evaluation of bids and advice in problems of operation. In promoting the exchange of information, the programme is giving more attention to operational experience and data, and to topics that are particularly important in making technical and economic assessments of proven reactor systems. Prospecting for uranium is being resumed on a large scale, and the Agency is giving more attention to the use of low-grade ores, to the production of uranium as a by-product in processing of other minerals and to the best use of nuclear fuel resources, as well as to the potential use of thorium and the development of advanced converters and breeder reactors. At the same time, the Agency continues to promote co-ordination of work between research reactor centres in developing countries.

### Technical aspects of nuclear power

31. The conclusions of a symposium on heavy-water power reactors, held in September 1967 have been described in the supplement to last year's report [ 7 ]. A symposium on fast reactor physics and related safety problems, held in Karlsruhe in November 1967, showed that there was growing interest, at least in Europe, in steam-cooled fast reactors.

32. A panel on thorium utilization, held in June 1968, examined the extent to which economic incentives exist to develop thorium fuel systems in competition with advanced uranium fuel systems and fast breeder systems. It also discussed technical problems that still have to be overcome with the thorium fuel system. A panel on small- and medium-power reactors in June 1968 examined the possibilities of reducing the cost and improving the design of such plants. This question is of special interest to developing countries which may not be able to use larger nuclear plants, that is plants of a capacity greater than 300 MW(e).

33. To promote the fuller exchange of information on research and development relating to fast reactors, co-ordinate the many international meetings on this subject, identify subjects on which further work is necessary and advise the Agency about its future activities, the Agency has established an International Working Group on Fast Reactors. It has also established a Working Group on the Engineering Aspects of Embrittlement of Pressure Vessel Steels under Irradiation.

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[ 6 ] A list of power reactors in operation and under construction in Member States is given in the survey "Power and Research Reactors in Member States" which was prepared by the Agency in January 1968, and which is available upon request.

[ 7 ] INFCIRC/103, para. 7(a).



## Nuclear fuels

34. It is planned that the Agency will serve as a world-wide clearing house for information on the nuclear fuel resources and their evaluation, uranium and thorium geology, ore processing and mining and related subjects. The General Conference has been informed of the Agency's co-operation with ENEA in this regard [ 8 ]. In December 1967 the Agency and ENEA published a report on revised estimates of uranium resources which provides the latest information made available by the major producers. The Secretariat is also studying the world's requirements, up to 1980, for enriched uranium to be used in power reactors and world-wide production capacity of this material, to the extent that the information is available.

## Supply of nuclear materials

35. The Board gave its approval for the supply of nuclear materials through the Agency as indicated in Table 7 below.

Table 7

### Supply of nuclear material

Receiving State	Project	Supply approved (approximate quantity)
Democratic Republic of the Congo	TRICO research reactor fuel elements	400 g uranium (20% enriched)
Romania	Research on radiation stability of nuclear fuel	100 g uranium (20% enriched)
Romania	Measurement of fission cross-section for plutonium-239 at thermal neutron energy	1 g plutonium-239 with an isotopic purity of 99.88% <sup>a/</sup>
Yugoslavia	Triga Mark II research reactor (fuel elements) at Jozef Stefan Nuclear Institute	764 g uranium (20% enriched)

<sup>a/</sup> Supplied free of charge by the Government of France.

36. The special fissionable material to the value of \$50 000 granted by the United States of America for 1967 was allocated as set forth in Table 8 below.

[ 8 ] GC(XI)/355, para. 26.

Table 8

Allocation of special fissionable material granted  
by the United States for 1967

Receiving State	Approximate quantity	Approximate value
Democratic Republic of the Congo	400 g uranium (20% enriched)	\$ 900
Iran	3110 g uranium (93% enriched)	\$34 800
Mexico	80 g plutonium	\$ 3 440
Spain	925 g uranium (90% enriched)	\$10 000
Viet-Nam	382 g uranium	\$ 860

Economics

37. Recently there have been rather wide variations in the costs that manufacturers have quoted for nuclear plants of similar type and size. In particular, the costs quoted within and outside the country of manufacture have shown considerable differences. This is a matter of particular interest to developing countries and the factors accounting for these differences were reviewed at a symposium on the international extrapolation and comparison of nuclear power costs, held in London in October 1967.

38. A symposium on the economics of nuclear fuels, held in Gottwaldov, Czechoslovak Socialist Republic, in May 1968, reviewed costs of fabrication and reprocessing, prospects of plutonium recycling, problems of nuclear fuel management, and other economic problems of the nuclear fuel cycle that are of special interest to power planners.

Nuclear desalination and energy centres

39. The nuclear desalting plants being built in the Soviet Union and the United States will produce water cheaply enough for municipal and industrial, but not for agricultural use. However, recent studies have shown that "energy centres" consisting of very large reactors that would feed low-cost power and heat to a cluster of energy-intensive industries, such as desalting plants, fertilizer factories, food processing, metallurgical and chemical plants, are likely to become feasible in the future and may produce desalted water at a cost low enough for agricultural use. The Agency is keeping in touch with the studies being made at the United States Oak Ridge National Laboratory on this subject. It also convened a panel jointly with FAO in October 1967 to study the value of high-quality desalted water in agriculture. Some of the main recommendations were that experimental agricultural facilities should be established to study subjects such as the effects of soil salinity and of the quality of water on crops, and the possibilities of blending desalted water with brackish or drainage water, and to develop methods that would reduce the amount of high-quality water needed to irrigate a field without reducing the crop it yields.

40. The report of the joint Agency/Mexico/United States feasibility study of a large dual-purpose plant near the head of the Gulf of California [9], will be presented to the two Governments for further action in mid-1968; this will complete the first phase of what may

[9] GC(XI)/355, para. 36.

become the world's largest nuclear desalting programme. The Agency has also continued to support research on desalting costs and has published a general "Guide to the Cost of Water from Nuclear Desalination Plants" designed to help economic planners to decide whether or not nuclear desalting may be feasible under particular circumstances.

#### Reactor research

41. The NORA project on the physics of light- and heavy-water-moderated lattices fuelled with uranium dioxide ended in June 1968, and a seminar will be held to review the results of the research undertaken on this subject. The Republic of Korea and Thailand have joined the India/Philippines/Agency regional joint training and research programme (IPA) and are supporting neutron spectrometry studies. The Norway/Poland/Yugoslav project on co-operative research in reactor physics (NPY) is giving more attention to research on digital computer control of reactors.

42. In December 1967, a panel reviewed the Agency's programme of support to research reactor centres and recommended that the training to be provided at such centres should be integrated to the extent possible in university education in the countries concerned. It also recommended that the Agency should publish a number of manuals on experimental techniques and promote the exchange of information between small reactor centres by encouraging the publication of newsletters.

43. Regional study group meetings have been held in October 1967 in Tokai, Japan, for scientists from nuclear centres in the Far East and, with the help of IANEC, in Bogotá, Colombia, in December 1967 for Latin American centres.

#### Other activities

44. In January 1968, the Agency published the seventh volume of the "Directory of Nuclear Reactors"; this covers 49 new power reactors in 12 countries. In the field of advanced power generation, the joint IAEA/ENEA Liaison Group on magnetohydrodynamic electrical power generation met twice during the year to review the progress made in this system and to help plan a symposium that will be held in Warsaw in July 1968.

## ISOTOPES AND RADIATION SOURCES

45. The Agency's work on isotopes and radiation sources includes co-ordinating and supporting research, organizing scientific meetings concerned with this subject and other special projects. The Divisions concerned (Food and Agriculture and Life Sciences) are also continuously associated from a scientific point of view with the planning and carrying-out of the Agency's technical assistance programme which is summarized at the beginning of this report. This also applies to part of the work of other Divisions, such as the Divisions of Research and Laboratories and Health, Safety and Waste Disposal.

### Food and Agriculture

#### General

46. Approximately half of the work of the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture is carried out through research contracts or cost-free research programmes. Almost all of these are integrated into co-ordinated programmes which have well-defined objectives and which are periodically reviewed by the contractors. Their present scope is given in Table 9 below:

Table 9

## Co-ordinated programmes in food and agriculture

Research programme	Countries in which co-ordinated programmes in food and agriculture are being carried out
1. Wheat fertilization programme	Argentina, Brazil, Mexico, Peru, Romania, United Arab Republic
2. Tree crop fertilization programme	Ceylon, China, Colombia, Ghana, Ivory Coast, Kenya, Malaysia <sup>a/</sup> , Philippines, Spain, Tunisia
3. Plant nutrient supply and movement	Australia, Belgium <sup>a/</sup> , Denmark <sup>a/</sup> , Hungary (1+1 <sup>a/</sup> ), India, Japan, Netherlands <sup>a/</sup> , Poland <sup>a/</sup>
4. Water use efficiency	Belgium, Brazil, Federal Republic of Germany <sup>a/</sup> , Iraq, Israel, Kenya, Lebanon, Morocco, Pakistan, United Arab Republic
5. Entomology; sterile-male technique	Australia, Austria <sup>a/</sup> , Belgium, El Salvador, France <sup>a/</sup> , Federal Republic of Germany (2 <sup>a/</sup> ), Greece, Israel, Japan, Kenya, Republic of Korea (2), Pakistan (2), Peru, Portugal (2), Spain, United Arab Republic, United Kingdom <sup>a/</sup> , Yugoslavia
6. Use of neutrons in seed irradiation	Austria, Bulgaria, China, France <sup>a/</sup> , India, Netherlands <sup>a/</sup> , Philippines, Thailand, United Kingdom <sup>a/</sup> , United States (3 <sup>a/</sup> )
7. Rice mutation breeding	Brazil, Ceylon, China, India, Japan, Republic of Korea, Pakistan (2), Philippines, Thailand
8. Production and use of induced mutations in plant breeding	Argentina, Australia, France <sup>a/</sup> , Federal Republic of Germany <sup>a/</sup> , India <sup>a/</sup> , Italy (2 <sup>a/</sup> ), Japan <sup>a/</sup> , Norway, Sweden (2 <sup>a/</sup> ), United States (5 <sup>a/</sup> ), Yugoslavia <sup>a/</sup>
9. Isotopes and radiation in control of parasitic diseases	Czechoslovak Socialist Republic <sup>a/</sup> , Denmark <sup>a/</sup> , Hungary <sup>a/</sup> , Israel <sup>a/</sup> , Italy <sup>a/</sup> , Kenya, Poland, United Kingdom (2 <sup>a/</sup> ), United States <sup>a/</sup> , Yugoslavia <sup>a/</sup>
10. Trace element metabolism and disease in animals of agricultural importance	Denmark <sup>a/</sup> , Federal Republic of Germany (2 <sup>a/</sup> ), Netherlands <sup>a/</sup> , United Kingdom (2 <sup>a/</sup> ), United States <sup>a/</sup> , Yugoslavia <sup>a/</sup>
11. Microbiological aspects of food preservation by irradiation	Australia <sup>a/</sup> , Federal Republic of Germany <sup>a/</sup> , Hungary <sup>a/</sup> , Japan (1+1 <sup>a/</sup> ), Sweden <sup>a/</sup> , Thailand, United States (2 <sup>a/</sup> )
12. Tissue physiology in food preservation by irradiation	Chile, Federal Republic of Germany <sup>a/</sup> , Israel, Italy, Japan, Pakistan, Philippines
13. General food irradiation	Denmark <sup>a/</sup> , Hungary, Republic of Korea, Netherlands (2), Spain

<sup>a/</sup> These contracts are "cost-free co-operation agreements".

### Soil fertility and irrigation

47. The two large research programmes designed to find the best ways of applying fertilizers to rice and maize by using isotope techniques have been completed, and a similar programme has been started (No. 2 in the table above) to study rooting patterns and efficient fertilizer use in tree crops such as coconut, oil palm, coffee, cocoa, olive and citrus. A research programme on the use of wheat fertilization (No. 1 in the table) - largely replacing that on maize - started in 1968. The rice and maize research programmes produced results of direct practical interest to farmers; they also showed the unique efficacy of isotope techniques for evaluating quantitative differences in the uptake of fertilizers.

48. A co-ordinated programme (No. 4 in the table) in nine countries is using radiation techniques to study water use efficiency under different climatic conditions. Studies conducted with maize, now in their third year, have provided valuable data and have demonstrated the feasibility of using the neutron moisture meter to determine soil moisture under practical field conditions.

### Radiation entomology

49. In the Special Fund project for the eradication of the Mediterranean fruit fly in Central America, more than fifty million flies are now being released each week in two experimental areas. An experiment carried out on the Isle of Capri, in co-operation with the Italian Government, demonstrated that the sterile male technique can be effective in eliminating the Mediterranean fruit fly. The Joint Division is continuing to support research on the olive fly, in which good progress has been made, the tsetse fly, a species of rice stem borer, the torsalo fly and other insect pests (No. 5 in the table). A symposium was held in Vienna in December 1967 to review recent developments and the various uses of radiation and isotopes in entomology, and a training course on the same topic was held in Florida, United States, in November 1967.

### Pesticide residues and food protection

50. The Agency and FAO have continued to provide information to UNSCEAR on the amount of radionuclides from fallout in the food produced in various countries. An Agency/FAO panel met in Lisbon in October 1967 and prepared a report on the acceptable level of radionuclides in the human diet.

51. The Secretariat is giving more attention to applying analytical quality control for assaying various radionuclides in food and other biological materials and for determining their effects. A questionnaire has shown that many laboratories in Member States are interested in expanding this programme and lectures on the subject have been given at UNSCEAR, in the Czechoslovak Socialist Republic and Italy.

### Plant breeding and genetics

52. In 1966 the Agency and FAO started trials of radiation-induced mutants of durum wheat in various countries in the Middle East, North Africa and Southern Europe. During the second year, very encouraging results were obtained; some of the mutants cut yielded the best local varieties in several of the countries where trials had taken place.

53. In co-operation with the Reactor Group of the Austrian Studiengesellschaft für Atomenergie, the Agency has been able to develop effective techniques to use neutrons from pool-type reactors in biological research, and a co-ordinated programme (No. 6 in the table) for using such neutrons by irradiating seeds to obtain new mutants of plants has been launched.

54. Several encouraging results have also been obtained by laboratories working under Agency contracts. Thus, for instance, radiation treatment has made it possible to exchange desirable characteristics between japonica and indica types of rice (No. 7 in the table). This may be of considerable importance to rice growers in South and East Asia and the Far East.

55. The value of obtaining information quickly about the different characteristics of new mutants and of existing varieties has led FAO, with the Agency's help, to begin work on world-wide computerized mutant records.

#### Animal protection and disease control

56. The two main programmes (Nos 9 and 10 in the table) deal respectively with the use of radiation to improve vaccines (radiation vaccines are particularly effective in treating animal diseases caused by worms and other parasites) and with the effects of trace elements, and trace element deficiencies, on the metabolism and health of various species of livestock.

57. A meeting of experts took place in Vienna in August 1967 to review recent developments in the use of isotopes and radiation in studying and controlling parasitic diseases. A symposium in the same month reviewed the biological importance of nitrogen in the soil-plant-animal system. In October and November 1967 the Agency and FAO also arranged a regional training course in the Czechoslovak Socialist Republic on isotopes and radiation in animal science and veterinary medicine.

#### Food irradiation

58. The potential use of radiation for lengthening the storage life of fresh fish was discussed at a technical conference arranged by FAO and the International Institute of Refrigeration, in Madrid in September 1967 on the freezing and irradiation of fish. A panel on the enzymological aspects of the application of ionizing radiation to food preservation held in April 1968 stressed the need for further studies on the radiation inactivation of enzymes in food products.

59. Since food irradiation is becoming a practical industrial possibility, the Agency and FAO are giving more attention to its legislative and wholesomeness aspects and are collecting and evaluating information concerning legislation in Member States. A panel which met in November 1967 has prepared a report on microbiological standards and methods for testing irradiated food, which will be of use to Member States when considering legislation in this field.

60. The Joint Division has continued to provide advice and support to Member States for their projects to build pilot plants and their research programmes, and the Agency and FAO held an eight-week international training course on food irradiation in Michigan, United States, from June to August 1968. A special programme on the radiation preservation of fish has been started in Iceland; and a regional study group on food irradiation met in Sofia, Bulgaria, in June 1968.

61. The international research programme on food irradiation which is being jointly supported at Seibersdorf by the Agency, ENEA and the Austrian Studiengesellschaft was reviewed at a meeting at ENEA's headquarters in February 1968. As a result of this review, it seems likely that research work on radiation preservation of fruit juice will be completed as quickly as possible and that a new project involving wholesomeness testing of staple foods of world-wide interest will be started in 1969.

## Life sciences

### Nuclear medicine

62. The present research support programme is summarized in the table below:

Table 10

Distribution of research contracts on radioisotope applications in medicine

Research topic	Countries in which research is conducted with Agency support
Anaemia	Ecuador, Ghana, Greece, Iraq, Japan, Republic of Korea, Lebanon (2), Madagascar, Pakistan, Romania, South Africa (2), Turkey, United Arab Republic
Goitre	Austria, Belgium, Bolivia, Bulgaria, Iraq, Japan, New Zealand, Spain, Turkey, United Arab Republic
Malnutrition	Argentina <sup>a/</sup> , Brazil <sup>a/</sup> (2), Ecuador, Guatemala, India <sup>a/</sup> , Iran <sup>a/</sup> , Israel <sup>ab/</sup> , Italy, Jamaica <sup>a/</sup> , Nigeria, Pakistan, Philippines <sup>a/</sup> , South Africa <sup>a/</sup> , United Arab Republic <sup>a/</sup>
Parasitic diseases	Israel, Japan, Philippines, Uruguay

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.

63. The research topics are for the most part those that were given priority by a joint Agency/WHO panel in 1962. With the help of WHO, the Agency held a meeting in May 1968 to review the programme and to recommend the subjects on which contracts should be awarded in future. The meeting also recommended a number of programmes that could be developed as joint projects of the Agency and WHO. This followed extensive consultations with various scientific and medical units of WHO which explored the possibility of using nuclear science techniques in support of various programmes of that organization.

### Radiation biology

64. The current distribution of research contracts concerned with radiation biology is given in the table below:



Table 11

## Distribution of radiation biology research contracts

Research topic	Countries in which research is conducted with Agency support
Mechanisms of radiation injury (somatic and genetic)	Argentina (2), Australia, Belgium, Bulgaria (2), Czechoslovak Socialist Republic, Federal Republic of Germany, Hungary, Republic of Korea (2), Netherlands (3), Poland, Turkey
Modification of radiation injury	Belgium, Chile, Hungary, Italy, Japan, Spain, United Kingdom
Radiobiological applications	Austria, Denmark, Hungary (2), Italy, Republic of Korea, Romania, Turkey

In addition, cost-free research agreements have been initiated in the radiosterilization of medical products and biological tissues with Hungary, Poland and Yugoslavia.

65. Greater emphasis is now being given to practical applications such as the use of radiation in tissue transplantation and the study of immunological processes and cell proliferation.

66. Other main developments have been:

- (a) A panel on the biological effects of transmutation and decay of incorporated radioisotopes, held in October 1967, which considered the effects of ingested or inhaled radioactive materials. The panel showed that internal radiation causes genetic damage in the human embryo;
- (b) A symposium on the effects of radiation on cellular proliferation and differentiation, held at Monaco in April 1968. The main subjects of discussion were the effects of radiation on the stem cells which produce blood cells and the processes that occur in cells during repair and recovery after radiation damage; and
- (c) A consultants' meeting, held at Bangkok in May 1968, which discussed the radiosensitivity of animal poisons such as snake venom and considered the use of radiation to de-toxicate and sterilize venoms and thus produce antivenoms.

#### Radiation dosimetry

67. The need continues to grow for international standards to measure accurately the radiation doses given in medical diagnosis and therapy, and to ensure comparability of the results of biological experiments. A panel on medical radiation dosimetry in October 1967 made recommendations regarding the work that the Agency should undertake in disseminating such standards, the intercomparison of radiation sources and instruments, and the training of personnel in radiation physics.

68. Following a joint Agency/WHO meeting on medical radiation physics in Geneva in December 1967, a panel was held in April 1968 in Caracas to consider the dosimetry requirements of radiotherapy centres in Latin America.

69. The computer is beginning to play a larger role in the planning of radiation treatment; in July 1967 a panel on this subject reviewed the use of such machines in calculating external and internal doses, in storing and retrieving patient records and in the automated control of radiation therapy.

70. During the period under review, two research contracts were renewed with institutes in Poland and Yugoslavia, on the development of new dosimeter systems, and in the framework of a co-ordinated programme on the biophysical aspects of radiation quality, one research agreement each was signed with institutes in the Netherlands and the United Kingdom and two with institutes in the United States.

### Hydrology

71. It is expected that late in 1968 it will be possible to begin regular publications of the results now being stored in the Agency's computer of the world-wide survey of tritium, deuterium and oxygen-18 content in rainfall and other forms of precipitation that the Agency and WHO started in 1961. 150 stations in various parts of the world are taking part in this work.

72. It will be recalled that the Agency is assisting UNESCO in the International Hydrological Decade. The IHD Working Group on Nuclear Techniques in Hydrology, for which the Agency is the technical secretariat, has held two further meetings and is preparing a guide-book on nuclear techniques in hydrology.

73. The Agency has continued its hydrological isotope studies in water development projects in Jamaica, Jordan, the Niger, Spain and Uganda. It has started new programmes in the Lake Chad basin, the Senegal River basin, Dahomey, Morocco and India, as well as a second programme in the Niger.

74. The Agency has also launched a co-ordinated research programme to determine the relationship between the isotopic content of precipitation and moisture in the soil; institutes in Austria, Belgium, Denmark, Kenya and the United States are taking part in this programme. The distribution of research contracts in the field of hydrology is shown below:

Table 12

#### Distribution of hydrology research contracts

Research topic	Countries
Field applications of isotope techniques to specific problems	Hungary (2), Kenya, Republic of Korea, Romania (2), Tunisia, Turkey
Development of field methods	Federal Republic of Germany, New Zealand, Poland, Spain
Basic research	Denmark, France, Federal Republic of Germany

75. In June 1968, the Agency held a panel to discuss the latest developments in the interpretation of environmental isotope data in hydrology.

## Industry

76. It is well known that radiation is most effective in increasing the strength and durability of wood impregnated by plastics. In November 1967 the Agency convened a study group at Bangkok on impregnated fibrous materials, to discuss the potential industrial use of radiation in improving the physical and chemical properties of the large amounts of vegetable fibre that are produced and used in this region.

77. The use of neutron moisture meters is referred to in paragraph 48 above. Through research contracts and agreements the Agency is supporting work to improve the technical characteristics of these instruments and to ensure that they are correctly used. In May 1968, it helped the International Union of Testing and Research Laboratories for Materials and Structures to organize an international meeting at which the performance of most of the commercially available instruments were assessed and theoretical and practical calibrations were made.

78. A panel on radioisotope X-ray fluorescence applications in May 1968 appraised the current and potential value of this technology and identified particular applications where it can help meet industrial requirements in Member States, especially in mineral resource development.

## HEALTH, SAFETY AND WASTE MANAGEMENT

79. The Board reported last year that this programme was giving more attention to helping developing countries to deal with their local safety problems. [10] This trend has continued. During the period under review seven staff members visited six countries to give advice, and institutes in sixteen countries were helped in other ways. Health and safety measures have been applied by agreement to six assisted projects of which five involved the supply of reactor fuel; these measures are now being applied to projects involving a total of about 70 transfers of nuclear material. Radiological protection services have also been provided to some Agency staff such as laboratory personnel and safeguards inspectors.

80. Thirty-seven research contracts and research agreements are at present being carried out; their distribution is shown in the following tables.

Table 13

### Distribution of radiation protection research contracts and agreements

Research topic	Countries in which research is conducted with Agency support
Radiation protection	Czechoslovak Socialist Republic, Italy, Japan, Poland, Romania, Sweden
Measurement techniques in radiation protection	Austria, France <sup>a/</sup> , Federal Republic of Germany, India

<sup>a/</sup> Cost-free research agreement.

[10] GC(XI)/355, para. 67

Table 14

Distribution of waste management research  
contracts and agreements

Research topic	Countries in which research is conducted with Agency support
Research in marine radioactivity <sup>a/</sup>	Argentina <sup>b/</sup> , India <sup>b/</sup> , Israel, Italy <sup>b/</sup> , Japan <sup>b/</sup> , New Zealand <sup>b/</sup> , Poland <sup>b/</sup> , Romania <sup>b/</sup> , United Arab Republic, Yugoslavia <sup>b/</sup> .
Low- and medium-level radioactive waste management	Czechoslovak Socialist Republic, Hungary (2), India, Italy, Republic of Korea (2), Pakistan (2), Philippines, Tunisia, Turkey, United Arab Republic (2), Union of Soviet Socialist Republics (2), Yugoslavia.

<sup>a/</sup> Research programme co-ordinated with the International Laboratory of Marine Radioactivity at Monaco.

<sup>b/</sup> Cost-free research agreement.

Health and safety

81. Almost all international transport organizations have now brought their regulations into line with the 1967 edition of the Agency's Regulations for the Safe Transport of Radioactive Materials. IATA has adopted them provisionally, pending acceptance by all Governments concerned, as an alternative to their existing regulations. In April 1968 the Agency arranged a preliminary meeting on the problems arising in the practical application of these regulations.

82. Since inhalation is probably the main potential route of internal contamination of personnel working in nuclear facilities, the Agency held a symposium in July 1967 to review the instruments and techniques used in assessing airborne radioactive contamination. The symposium discussed particularly the problems of sampling and assaying specific radionuclides, and the characteristics of aerosols. The Agency is also helping to co-ordinate national research on aerosol behaviour and is preparing a report, with the help of a panel of experts, on inhalation risks.

83. In co-operation with WHO and FAO the Agency is preparing a manual on the plans which should be made to handle any "on-site" and "off-site" radiation accidents that may occur. The three organizations have also informed their Member States of the assistance that other Members have offered to provide in case of an accident. In October 1967 the Agency and WHO held a training course on this subject in Manila for developing countries in South East Asia and the Far East.

84. The Agency has established a service to assist laboratories in Member States to check the reliability and accuracy of the measurement of radiation for protecting personnel against radiation exposure with the aid of photoluminescent glass dosimeters.

85. In October 1967 the Agency arranged a meeting in Athens of 26 experts from neighbouring countries to discuss recent developments in health physics and to review the special problems encountered by countries in the region. WHO took an active part in this meeting.

86. From 1968 onwards the Agency will also issue each year a collection of abstracts of articles dealing with research undertaken by Member States on radiation protection topics. Two additional safety standards, one prepared in collaboration with ENEA and one with ILO, and two manuals of guidance on radiation protection topics have also been issued.

87. Other help given to Member States has included:

- (a) An international advanced training course on bio-assay methods, at the Agency's Laboratory at Seibersdorf in November 1967;
- (b) Visits by a group of experts to seven countries in Latin America in March and April 1968 to give information about the latest developments in monitoring techniques and to advise on the problems of centres in those countries; and
- (c) A tour in April and May 1968 by 14 radiation protection specialists from developing countries to institutes in the Soviet Union, Poland and the Czechoslovak Socialist Republic.

#### Waste Management

88. There are wide differences in the systems that the various countries use to classify types of radioactive wastes, and this makes international discussion of the subject difficult. With the help of a panel of experts the Agency has prepared, for publication in its Safety Series, a recommended classification of standard categories of solid, liquid and gaseous waste.

89. In December 1967, the Director General asked Member States to co-operate in preparing a detailed register of radioactive waste discharges into international waters. Preliminary responses have been received. The programme of the International Laboratory of Marine Radioactivity at Monaco is also being integrated closely into the Agency's general programme concerned with waste release into the sea.

90. The Agency has published five manuals and guidebooks concerning chemical treatment of low- and intermediate-level liquid wastes and sludges and the economics of such waste treatment.

91. A regional meeting on co-ordination of research in management of radioactive wastes was held in November 1967 in Singapore for ten countries from South East Asia and the Far East. The Agency also organized an advanced training course in radioactive waste management at Oxford, England, in September 1967 which was attended by 39 experts from 27 countries.

#### Reactor safety

92. The Agency has sent missions to New Zealand to advise on siting problems in connection with that country's contemplated first power reactor, and to Yugoslavia to advise on safety aspects of all nuclear installations in that country and on the general organization of its national programme.

93. A "travelling seminar" visited six countries in Latin America in May 1968 to review and discuss local reactor safety and siting problems.

94. The Agency's Code of Practice for the Safe Operation of Nuclear Power Plants will be issued in 1968. In the meantime reports or recommendations have been published on the role that meteorology plays in the safe operation of nuclear facilities; the aseismic design and testing of nuclear facilities; and the safety assessment of ports and harbours for the entry of nuclear ships.

## RESEARCH AND SERVICES IN PHYSICAL SCIENCES

### Physics

#### Nuclear data

95. The Agency's Nuclear Data Unit continued to promote the exchange of data between the three regional centres at Brookhaven (United States), Obninsk (Soviet Union) and the ENEA Centre (Saclay, France), and to serve as the fourth data compilation and distribution centre giving particular attention to countries not covered by the other three. It convened meetings of consultants from the four centres, in Vienna in August 1967 and in Saclay in February 1968. As a result of these meetings, the centres are promoting co-operation in the development of an international nuclear data index to complement the present bibliographical index (CINDA) with which it may be merged in due course. A group of experts was convened to re-examine evaluation techniques and data selection criteria by which the Nuclear Data Unit furnishes current "best values" for the 2200 m/sec cross-sections of fissile nuclides on a regular basis. The International Nuclear Data Committee referred to in last year's report [11] held its first meeting in Vienna from 13 to 17 May 1968.

#### International Centre for Theoretical Physics

96. The Italian Government has approved the agreement with the Agency which will ensure continuation until 1974 of the International Centre for Theoretical Physics at Trieste, to which the Ford Foundation is also contributing \$200 000 for the period 1967 to 1970 inclusive. The Director General is in consultation with UNESCO about joint Agency-UNESCO operation of the programme of the Centre on the basis of equal financial contributions as of 1970.

97. The Centre organized a two-month course on the advanced theory of condensed matter, which was attended by 101 participants from 31 Member States, and continued research on theoretical high-energy and nuclear physics. During the academic year 1967/68 eleven fellowships were awarded to students from the same number of countries, and 55 scientists from 21 countries joined the staff for periods ranging from one to 12 months. Several of these scientists are taking part in the Centre's Associate Membership scheme which enables them to spend one to four months each year at the Centre, on leave of absence from their parent universities or institutes. It is hoped that this arrangement will help to diminish the "brain drain" of theoretical physicists from the developing countries.

#### Other activities

98. Computer techniques for solving the complex problems involved in the design of contemporary reactor systems were described at the Agency's symposium on neutron thermalization in July 1967.

99. A symposium on neutron inelastic scattering in solids and liquids held in May 1968 in Copenhagen discussed recent results on investigation of solid and liquid dynamics, and magnetic systems. This was the Agency's fourth symposium on this subject.

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[11] GC(XI)/355, para. 82.

100. For the benefit of the Member States in Eastern Europe and the Mediterranean area, the Agency organized a study group meeting at Ljubljana, Yugoslavia in September 1967, to discuss new experimental techniques and current trends in the use of low-energy accelerators.

101. A review of the possible future activities concerned with outer space research has shown that the Agency should take a more active role in the exchange of information about the direct conversion of nuclear energy.

### Chemistry

102. The main activities have been:

- (a) A regional study group meeting at Lucas Heights, Australia, in June 1968, at which experts from reactor centres in South East Asia and the Far East discussed their isotope production programmes and the technical problems they encounter. This was the first regional meeting on this subject; and
- (b) The third symposium on thermodynamics of nuclear materials held at Vienna in September 1967. Useful new data about semi-metal compounds, transition metals and actinide carbides, solid solutions and alloys was reported. The symposium discussed the need for assessing thermodynamic data of various important nuclear materials.

### Laboratories

103. The General Conference is referred to the fifth annual report on the Agency's laboratory activities [12] for a full description of the work done in 1967 at Seibersdorf and Monaco. The steps being taken to integrate the programme of the Laboratory at Monaco into the Agency's general work on the subject of waste release into the sea are referred to in the section on Health, Safety and Waste Management, which also gives information about the Laboratory's responsibilities in co-ordinating research contracts and agreements.

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[12] IAEA Laboratory Activities, 5th Annual Report, Technical Reports Series No. 90.



## INFORMATION AND TECHNICAL SERVICES

### Documentation - International Nuclear Information System (INIS)

104. Member States have shown much interest in the INIS project. On the basis of draft standards prepared by consultants, a panel which met in December 1967 has approved a system for describing and cataloguing nuclear science information which will be used for experimental "in-put" while INIS is being designed. An international team, recruited at the beginning of 1968, is carrying out a detailed study of the entire proposal, and will draw up a first reference design of a working system. Several Member States and EURATOM have made available the services of experts for this study which is expected to be completed in the second half of the year. Some Member States have also agreed to supply sample in-put in respect of their national nuclear literature to permit experiments in the Agency's computer. With the reference design and the results of these experiments it is planned to have a proposal ready at the end of 1968 which, if acceptable, would permit INIS to be implemented on a minimum scale in 1970.

105. The microfiche clearing house, which is one component of the INIS project, came into operation at the end of 1967. For payment, it supplied microfiche copies of the reports that the Agency's library receives and to which the Agency draws attention in its periodic publication entitled "List of References on Nuclear Energy". The Agency's computer programming system (GIPSY) [13] is used to produce this list of references as well as a guide to recent literature in nuclear medicine, indexes to these publications and various bibliographies. The GIPSY system has also been used to prepare a world-wide index of teletherapy units. The Agency has placed an order for an IBM 360/30 computer which will be installed in late 1968 and will permit the Agency to consolidate all its data processing activities including those that are now carried out on external computers.

### Scientific meetings

106. Comparative information for 1966 and 1967 in respect of conferences, symposia and seminars is given in the following table:

Table 15  
Conferences, symposia and seminars

Item	1966	1967
Meetings	12	15
Participants	1826	2275
Countries taking part	59	53
Papers presented	784	700

[13] GC(XI)/355, para. 91.

107. The programme has continued to place emphasis on topics relating to nuclear power (six meetings) and the life sciences (five meetings). The Agency is now also giving financial help to enable more scientists from developing countries to take part in certain meetings.

### Publications

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

Table 16  
Publications

Subject	1966 %	1967 %
Nuclear power and reactors	15	20
Nuclear research	22	20
Health, safety and waste disposal	16	15
Food and agriculture	11	6.5
Life sciences	9	6
Theoretical physics	-	3.5
Public information	3	4
References and miscellaneous	24	25

109. Revenues from sales and publications amounted to \$121 000 in 1966 and \$155 000 in 1967, whereas the commercial value of publications distributed free to Member States amounted to \$450 000 both in 1966 and 1967.

### Library

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

Table 17  
Library holdings

Nature	End 1966	End 1967
Books	32 000	29 600 <sup>a/</sup>
Reports	90 000	105 800
Periodical subscriptions	1 100	1 150
Films	-	450
Film loans to Member States	630	650

<sup>a/</sup> The decrease is due chiefly to reclassification and "weeding out".

## SAFEGUARDS

### The Agency's Safeguards System (1965, as Provisionally Extended in 1966) [ 14 ]

111. In June 1967 the Board re-established the Working Group which it had set up in 1964, giving it new terms of reference to undertake the preparation of provisions extending the Agency's Safeguards System (1965, as Provisionally Extended in 1966) to plants for processing or fabricating nuclear material. [ 15 ] The Group met in November 1967 under the chairmanship of Dr. G. Randers of Norway, and in February 1968 the Board, after considering the draft safeguards provisions for conversion plants and fabrication plants formulated by the Group, requested it to meet again to study certain observations on and proposed amendments to the provisions which had been submitted. The Group accordingly re-assembled on 7 May and considered the observations and amendments and accepted some of them. The revised provisions for safeguarding conversion plants and fabrication plants were approved by the Board at the meetings in June 1968.

### Notification of transfers of nuclear materials

112. The Government of Canada has sent the Agency further periodic notifications of international transfers of nuclear materials covering the periods 1 January to 30 June and 1 July to 31 December 1967. Similar notifications have been received from the United States for the periods 1 July to 31 December 1966 and 1 January to 30 June 1967. The Government of Norway has also decided to notify the Agency of its international transfers of nuclear material and has transmitted the first notification, covering the year 1967.

### Safeguards agreements concluded in connection with the Treaty for the Prohibition of Nuclear Weapons in Latin America

113. In June 1968 the Board approved an agreement between Mexico and the Agency for the application of safeguards to materials, equipment and nuclear facilities in that country to ensure that they will not be used to further any military purpose. The agreement is in pursuance of a request made by Mexico unilaterally in terms of the Treaty for the Prohibition of Nuclear Weapons in Latin America and is the first such request under that Treaty. The safeguards provisions in this agreement when concluded will supersede those in the existing project agreement with Mexico, which entered into force on 18 December 1963. [ 16 ]

### Implementation of Agency safeguards

114. As shown in Table 18 at the end of this section, by 30 June 1968 the Board had approved a total of 39 safeguards agreements involving 29 States, as compared to 34 agreements with 27 Member States on 30 June 1967. [ 17 ]

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[ 14 ] INFCIRC/66/Rev. 1.

[ 15 ] GC(XI)/355, para. 99.

[ 16 ] INFCIRC/52.

[ 17 ] 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.

115. In the period under review the Board approved four new safeguards transfer agreements relating to bilateral co-operation agreements between the United States of America on the one hand and Colombia, Denmark, the Republic of Korea and Venezuela on the other, and also two agreements to replace those due to expire between the United States on the one hand and Japan and the Philippines on the other. Project agreements involving Agency safeguards were concluded with Viet-Nam and Yugoslavia; these relate to fuel for reactors already covered by previous agreements and do not therefore change the number of principal nuclear facilities under safeguards. Finally, the Board also approved an agreement for the application of safeguards to a multi-purpose nuclear power plant in China, pursuant to a request made unilaterally by that country. This constitutes the first unilateral submission agreement with an Asian country.

116. Once the safeguards agreements listed in Table 18 have all come into force, they will cover the 68 reactor facilities listed in Table 19, which is reproduced at the end of this section.

117. A list of reactor facilities covered by safeguards agreements does not give the full picture of the safeguards operation. A large part of the material to which these agreements pertain is outside reactor facilities, at separate locations, and separately accounted for under the Agency's safeguards system. Such locations include commercial establishments using safeguarded material in research of pilot-scale fabrication or processing, research and development installations and storage areas outside reactor facilities. They now number 37.

118. The total number of principal nuclear facilities, research and development facilities and other separate accountability areas where Agency safeguards are applied is now 105.

119. The safeguards agreements so far approved by the Board cover reactors of which the thermal capacity totals roughly 3220 MW. By far the greatest part of this figure is accounted for by six power stations, in China, Japan, Spain, the United Kingdom and the United States. The concept of thermal output does not relate to nuclear facilities and installations other than reactors, and in the graph that is reproduced at the end of this section, the curve representing thermal capacity of reactors covered by the Agency's safeguards agreements therefore gives only a partial picture of the Agency's safeguards effort.

120. The first inspection of a reprocessing facility was made during the processing of ten tons of irradiated fuel from the Yankee Atomic Power Station at the Nuclear Fuel Services Inc. plant in West Valley, New York, in the United States. The safeguarded material was processed in August and September 1967. The chief aims of the inspection were to establish that all safeguarded elements were put into the process, that the resulting dissolver solutions and plutonium product were carefully evaluated to determine actual plant input and output, and that all known discharges to waste were monitored. A detailed inspection was made of all work in the analytical laboratory. The amount of "material unaccounted for" in the course of inspection was less than 0.3% of the total throughput.

121. Ten inspectors took part in the operation. Key operations were inspected continuously but without interfering with the normal conduct of operations. The processed plutonium was subsequently placed in bonded storage at Hanford, Richland, Washington, where it is also inspected from time to time.

122. During the past year 31 inspections were made, in 16 Member States. [18] In addition, eight pre-operational visits were made to seven Member States. [19] Whenever possible pre-operational visits were made in conjunction with inspection travel to the State concerned or to States in the same general area.

#### Research and development programme

123. So far safeguards have been applied chiefly to individual reactor facilities (and the related accountability areas mentioned before) and in one case to a chemical reprocessing plant. It is likely that they will soon have to be applied to other facilities, such as conversion plants and fabrication plants, and in due course to combinations of different facilities. These developments will require new approaches; in particular different techniques must be used when safeguarding isolated facilities and comprehensive nuclear complexes. At the same time it is necessary to develop new instrumentation that will make the application of safeguards as effective, simple and inexpensive as possible. Hence, it has become necessary to pursue a vigorous research and development programme.

124. This programme is being carried out to a limited extent by the staff of the Agency; by far the most important part of the work is done in institutions in Member States under contract with the Agency or under other arrangements that allow the Agency to take note of the results. Much of this work is done by Member States to meet their own needs for the prudent management of nuclear materials and for national safeguards programmes. The Agency has developed close contacts with Member States in the hope of achieving co-ordination of effort, avoiding duplication of work and prompting the exchange of information.

125. In August 1967 the Agency convened a panel on safeguards techniques to advise on the priorities for research and development that it should undertake. The panel, in which experts from seven Member States took part [20], made recommendations for developing technical practices for various types of nuclear facilities, as well as for the general development of safeguards techniques. It also discussed the problems that are likely to arise when safeguards have to be applied to nuclear complexes in which materials flow through many or all plants in a fuel cycle.

126. In April 1968 a panel was held in Vienna on safeguards technical practices for irradiated fuel plants. This panel advised the Agency on the most effective and economical means of safeguarding this stage of the fuel cycle with minimum intrusion

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[18] In these figures an "inspection" is taken to be a single, distinct visit to a facility (including research and development facility) made for the purpose of ascertaining that the terms of the relevant safeguards agreements are observed and about which a report is made. An inspection is counted as one, no matter whether it is made by more than one inspector, lasts a considerable time or is briefly interrupted; the determining factor is the single report.

[19] The term "pre-operational" visit is used to mean a visit to any State with the purpose of preparing for the safeguarding of material and facilities, made before the entry into force of the relevant agreement or the assumption by the Agency of safeguarding responsibility.

[20] Canada, France, India, Japan, the Soviet Union, the United Kingdom and the United States. In addition, the Czechoslovak Socialist Republic, the Federal Republic of Germany, ENEA and EURATOM sent observers.

into plant operation. The experience so far gained in the inspection of reprocessing plants formed the basis of the discussions. Eight participants were invited to the panel. [ 21 ]

127. In the past year the Agency has used for the first time portable gamma spectrometers for non-destructive verification of inventories of safeguarded unirradiated fuel. The instruments proved their reliability and effectiveness in confirming calculations of the enrichment of the fuel elements of the various reactors inspected.

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[ 21 ] From Argentina, France, the Federal Republic of Germany, India, Japan, the Soviet Union, the United Kingdom and the United States. In addition, EURATOM, ENEA and the European Company for the Chemical Processing of Irradiated Fuels sent observers.

Table 18

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	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
Mexico <sup>a/</sup>	TRIGA III Reactor	18 Dec 1963	52
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
(Bilateral co-operation agreements between the indicated States)			
<u>Transfer Agreements</u>			
Argentina/USA		1 Mar 1966	79
Australia/USA		26 Sep 1966	91
Austria/USA		13 Dec 1965	76
Brazil/USA			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	109
Iran/USA		4 Dec 1967	108
Israel/USA		15 Jun 1966	84
Japan/USA <sup>b/</sup>		1 Nov 1963	47
Japan/UK		26 Sep 1967	107
Korea/USA		5 Jan 1968	111
Philippines/USA <sup>c/</sup>		24 Sep 1965	69
Portugal/USA		15 Dec 1965	77
South Africa/USA		26 Jul 1967	98
Spain/USA		9 Dec 1966	92
Thailand/USA		10 Sep 1965	68
Venezuela/USA		27 Mar 1968	
Viet-Nam/USA		25 Oct 1965	71
<u>Unilateral submissions</u>			
China	MZFR Power Reactor		
Mexico	All nuclear activities		
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		

a/ The safeguards provisions contained in the project agreement will be substituted by the safeguards provisions contained in the unilateral submission agreement, when it enters into force.

b/ The term of this agreement is due to expire on 31 October 1968. It will be replaced by a new agreement which has already been approved by the Board.

c/ The agreement which entered into force on 24 September 1965 expired on 19 July 1968 and has been replaced by a new agreement.

Table 19

Reactors<sup>a/</sup> under Agency safeguards or containing safeguarded material  
under agreements approved by the Board of Governors<sup>b/</sup>

Member State	Name of reactor	Location	Type	Capacity MW(th)	In opera- tion	Maximum routine inspections per year <sup>c/</sup>
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	0
	(TRIGA I)	Belo Horizonte	Triga I	.00	x	0
	(ARGONAUT)	Rio de Janeiro	Argonaut	.00	x	0
(Colombia)	(IAN-R <sub>1</sub> )	Bogotá	Light-water	.10	x	0
China	THOR/Tsing Hua Open Pool Reactor	Hsin-chu	Pool	1.00	x	1
	(MZFR Power Reactor)	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 <sup>c/</sup>	
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	
	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	Pelindaba	Tank	20.00	x	3	
	Critical Assembly	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)		
	JEN II	Madrid	Pool	.00	x)	1	
	ZORITA-1 Nuclear Power Station	Zorita de los Canes	Press. water	510.00		A	
Thailand	TRR-1/Thai Research Reactor 1	Bangkok	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 <sup>c/</sup>
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. 1, 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.

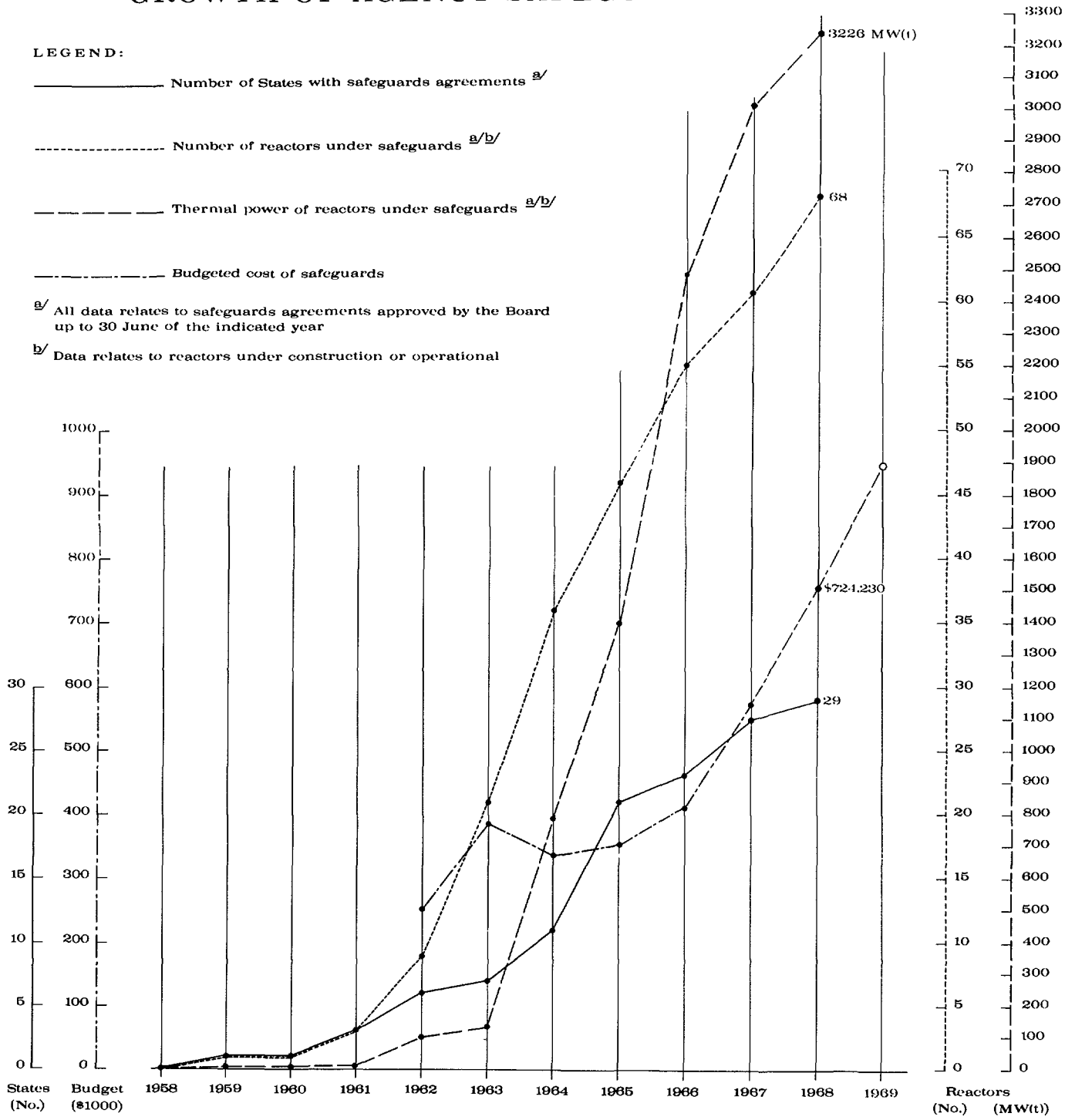
# GROWTH OF AGENCY SAFEGUARDS

**LEGEND:**

- Number of States with safeguards agreements <sup>a/</sup>
- Number of reactors under safeguards <sup>a/b/</sup>
- Thermal power of reactors under safeguards <sup>a/b/</sup>
- Budgeted cost of safeguards

<sup>a/</sup> All data relates to safeguards agreements approved by the Board up to 30 June of the indicated year

<sup>b/</sup> Data relates to reactors under construction or operational



## ADMINISTRATION

### External relations

128. In presenting the Agency's report to the General Assembly of the United Nations on 5 December 1967 the Director General communicated to it the statement made by the President of the General Conference at the eleventh regular session, expressing the Agency's "readiness to undertake its appropriate role in safeguards arrangements to be established under the Treaty" for the Non-Proliferation of Nuclear Weapons and affirming that the Agency would be prepared to accept this task. The General Assembly's discussion of the Agency's report and the Director General's statement bore chiefly on the Agency's safeguards and their possible use in carrying out such a Treaty. After the adoption, on 12 June 1968, by the General Assembly of the resolution commending the Treaty on the Non-Proliferation of Nuclear Weapons, the Director General, in a message to the General Assembly, reaffirmed the Agency's readiness to accept the safeguards responsibilities that the Treaty confers upon it.

129. The General Assembly also approved a resolution [ 22 ] calling for a fourth international conference on the peaceful uses of atomic energy in 1970 or 1971 that would have an agenda of interest to public officials, economists and planners as well as to technologists. The conference is to be convened under the aegies of the United Nations "with the fullest possible participation" of the Agency. In April 1968 the United Nations Scientific Advisory Committee considered the draft agenda for the conference on the basis of the suggestions made by the Director General and recommended that the Conference be held in 1971 in Geneva with the Agency playing the same role as at the Conference in 1964. The General Assembly will review the matter at its session beginning in September 1968.

130. The United Nations has appointed a power economist from its Division of Resources and Transport to improve liaison with the Agency particularly in regard to programmes for the development of power, desalting and natural resources.

131. Representations were made to FAO regarding a more equitable sharing of the costs of the work being done by the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture, as a result of which FAO has increased its contribution for 1968 in connection with the insect-rearing facility in the Agency's Laboratory by \$20 000.

132. As pointed out in the introduction to this report, co-operation with WHO in the framework of the arrangements made in 1966 is proceeding satisfactorily. To an increasing extent the Agency's work in medicine and biology is being integrated with WHO programmes, the Agency frequently serving as a technical adviser on nuclear science techniques and providing technical services. In health and safety matters, the WHO secretariat will co-operate in the revision of pertinent Agency standards, manuals and guides, and it is hoped that WHO's authority as well as the Agency's will be lent in appropriate cases. WHO has also made a valuable technical contribution to several Agency meetings.

133. Consultations with UNESCO regarding the financing of the International Centre for Theoretical Physics are referred to in paragraph 96 above. The Agency and UNESCO are also co-operating in introducing nuclear science into the curricula of schools and universities. The Agency and ILO have made arrangements for co-operation on the training of technicians at the ILO International Centre for Advanced Technical and Vocational Training at Turin, Italy.

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[ 22 ] Resolution 2309 (XXII).

134. To enable the Agency's Member States to make use of the services of the computer programme library of ENEA, the Agency has out-posted a scientist to that library. The collection and publication of information on uranium and thorium resources as well as liaison with scientists working on magnetohydrodynamic generation of power is now undertaken by jointly sponsored Agency/ENEA committees. The two agencies are also co-operating closely on two symposia in 1968.

135. Satisfactory technical and scientific co-operation has also been maintained with EURATOM, which continues to take part in all the scientific meetings of the Agency of interest to it, and which has given valuable help in the development of INIS. The Agency also assisted the Joint Institute for Nuclear Research at Dubna, Soviet Union, in arrangements for the international symposium on nuclear structure in July 1968. The Agency will hold a panel in Dubna on the future of nuclear structure studies immediately before this symposium.

#### Personnel

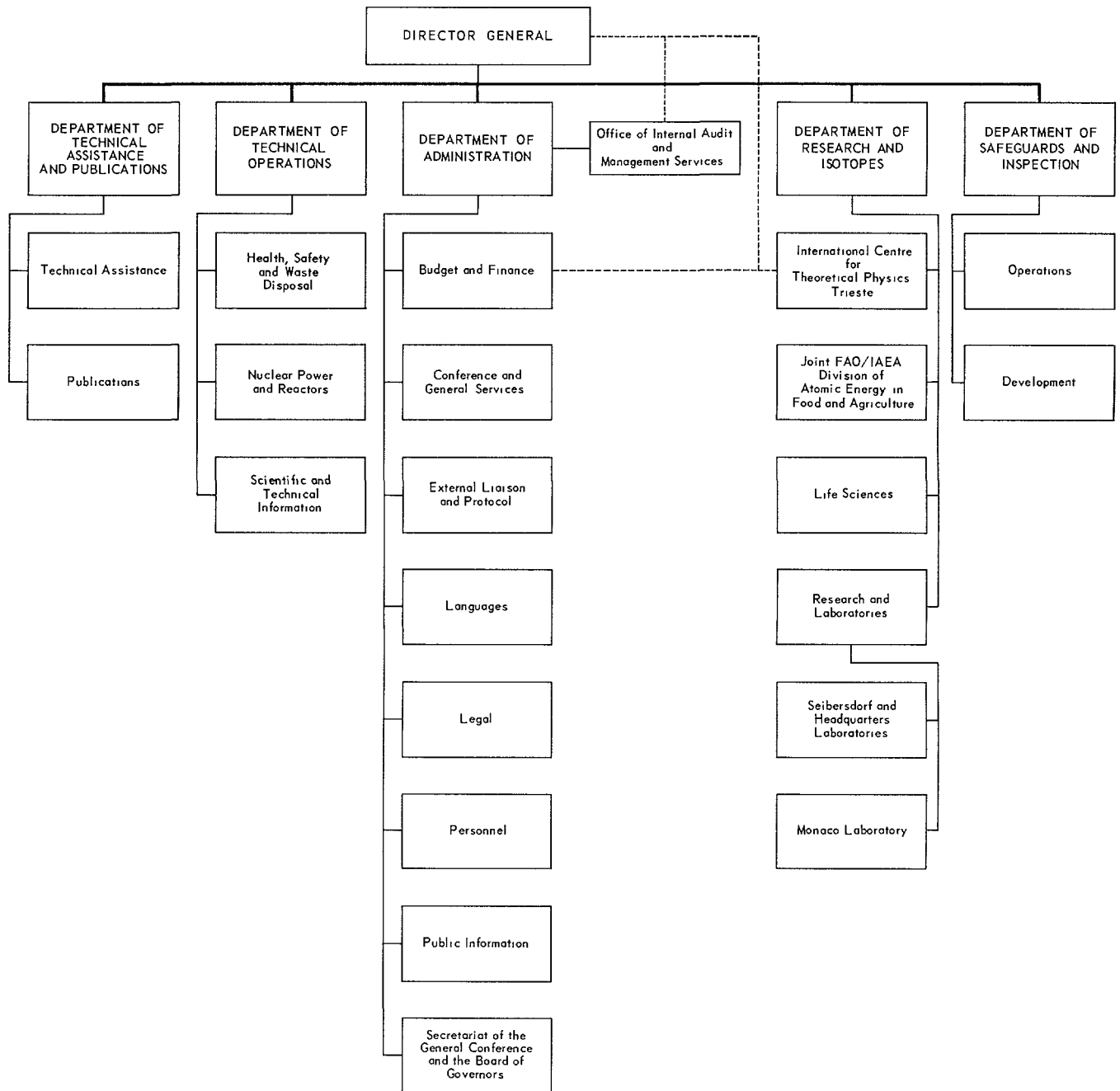
136. On 30 June 1968 the Secretariat had 314 staff members in the Professional category and above. Of these, 297 held permanent or fixed-term contracts, ten were serving under Special Service Agreements and seven were seconded to other United Nations organizations. Three hundred and one were employed at the Agency's Headquarters, four at Trieste, four in Monaco, two at New York, two at Geneva and one in Bangkok. The number of staff members holding posts that were subject to geographical distribution was 257. Forty-nine Member States and one non-member State were represented on the staff, one member of which was stateless. The Secretariat also included 471 General Service staff, ten of whom were serving in Monaco, 11 at Trieste, two at New York and two at Geneva, as well as 187 staff members in the Maintenance and Operatives Service. The total strength of the staff was thus 972. [ 23 ]

137. The organizational chart below shows the structure of the Secretariat as at 30 June 1968.

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[ 23 ] Details of the Agency's staff are to be found in document INFCIRC/22/Rev.8, 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 1967

138. The assessment of contributions on Member States included in the scale of assessment for 1967 amounted to \$9 174 000. The additional assessment of three new Member States (Sierra Leone, Singapore and Uganda) increased the total by \$11 010 to \$9 185 010.

139. By 31 December 1967, the Agency had received contributions towards the Regular Budget for 1967 amounting to \$8 516 908, which represents 92.73% of the total assessment. By 30 June 1968 \$8 548 571 or 93.07% of the total contributions due had been received.

140. The Agency's obligations for 1967 amounted to \$9 326 379 which resulted in budgetary savings of \$165 121 from the appropriations for 1967. A further \$14 578 from miscellaneous income and assessments on new Member States brought the total budgetary surplus at 31 December 1967 to \$179 699, as follows:

Budgetary savings		\$ 165 121
Contributions assessed on new Member States		11 010
Excess of miscellaneous income over budget		
Actual miscellaneous income	\$ 321 068	
Less: budget	317 500	3 568
Budgetary surplus for 1967		<u>\$ 179 699</u>

Since contributions in the amount of \$668 102 were outstanding from Member States for 1967, there was a provisional cash deficit of \$488 403.

141. Unliquidated obligations in respect of 1967 appropriations at 31 December 1967 were \$1 001 805, of which \$476 920 had been liquidated by 30 June 1968.

142. A transfer of \$1 226 was made from Section 2 - The Board of Governors, to Section 7 - Scientific and technical services and laboratory charges, and a total of \$124 129 was transferred from Section 1 - The General Conference (\$3885) and Section 8 - Salaries and wages (\$120 244) to Section 9 - Common staff costs, in order to cover increased costs.

The financial year 1968

143. By 30 June 1968 the following advances to the Working Capital Fund and contributions to the Regular Budget for 1968 had been received:

Advances to the Working Capital Fund	\$1 998 400
Contributions to the 1968 Regular Budget	\$3 352 243

By that date Member States had thus paid 99.92% of the total advances due to the Working Capital Fund and 32.98% of the total contributions due to the 1968 Regular Budget.

## Operational Budget

144. Although the General Conference at its tenth regular session again established a target of \$2 million for voluntary contributions in 1967, there was a shortfall of approximately \$560 000 in the actual pledges made by Member States. Of a total amount of \$1 441 021 pledged to the General Fund for 1967, \$1 219 654 had been paid by 31 December 1967. By 30 June 1968 receipts amounted to \$1 287 654, leaving a balance of \$153 367 still to be paid.

145. The total operational obligations incurred during 1967 amounted to \$2 586 550. Unliquidated obligations at 31 December 1967, including obligations brought forward from previous years, amounted to \$707 394.

### The Agency's resources in 1967

146. Resources equivalent to more than \$13 400 000 were at the Agency's disposal during 1967 under its own programme, UNDP/TA and Special Fund accounts and other special projects, including contributions in cash, services and kind. Details concerning these resources are set out in the table below:



Table 20

Funds and other resources at the disposal of the Agency in 1967<sup>a/</sup>

	\$	\$	\$
<u>Administrative Fund</u>			
Assessed contributions to the Regular Budget			
Member States included in the scale for 1967	9 174 000		
New Members	<u>11 010</u>	9 185 010	
Actual miscellaneous income		<u>321 068</u>	
Sub-total			9 506 078
<u>General Fund (including Operating Fund I and II)</u>			
Voluntary contributions pledged for 1967		1 441 021	
Miscellaneous income (from investments, laboratory, local project costs, exchange difference, etc.)		220 817	
Income from the Agency/United States Atomic Energy Commission Research Programme		5 410	
Special voluntary contributions pledged		<u>322 898</u>	
Sub-total			1 990 146
<u>Special Accounts</u>			
Saudi Arabian Project Trust Fund			
Income from the Government of Saudi Arabia		10 000	
Joint Research Programme of the Agency and the United States Atomic Energy Commission			
Income from the Atomic Energy Commission		23 315	
Special fellowships offered by the Government of the Union of Soviet Socialist Republics <sup>b/</sup>		89 333	
Venezuelan Project Trust Fund			
Income from the Government of Venezuela <sup>c/</sup>		<u>11 000</u>	
Sub-total			133 648
<u>United Nations Development Programme</u>			
<u>Technical Assistance Account<sup>d/</sup></u>			
Obligations incurred during the year 1967 (Project costs)			626 351
<u>Special Fund<sup>e/</sup></u>			
Funds committed during the year 1967			305 078
<u>Financial contributions received towards the cost of conferences, symposia and seminars for 1967</u>			
Amounts pledged			56 457
<u>Contributions in services and in kind<sup>f/</sup></u>			
Type II fellowships awarded <sup>g/</sup>		629 133	
Technical assistance equipment and supplies		60 000	
Laboratory equipment and supplies		41 000	
Library, etc.		4 020	
Special nuclear materials		<u>52 495</u>	
Sub-total			786 648
TOTAL			<u>13 404 406</u>

<sup>a/</sup> See the Agency's Accounts for 1967 (GC(XII)/384).

<sup>b/</sup> Ibid., Statement VII.

<sup>c/</sup> Ibid., Statement VIII.

<sup>d/</sup> Ibid., Statement IX.A.

<sup>e/</sup> Ibid., Statement X.A.

<sup>f/</sup> 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 the cost-free experts: 95 experts - 554 man/days in 1967.

<sup>g/</sup> 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

147. The Agreement on the Privileges and Immunities of the Agency is now in force between the Agency and 31 of its Member States.

148. Under the United Nations programme of assistance in the teaching, study, dissemination and wider appreciation of international law, two United Nations fellows received training in international and nuclear law for the duration of four-and-a-half months. Two more trainees, seconded by their Governments, were trained for one and six months respectively.

149. Two Member States were assisted in the detailed drafting of their atomic energy legislation.

### Public information

150. The Agency's film "The Atom Serves Man" was distributed in five languages to 74 television stations in 57 countries. A promotion and a training film were produced in co-operation with UNDP on the eradication of the Mediterranean fruit fly. A colour film on the use of whole-body counting techniques in connection with assessing malnutrition effects in Jamaica was produced in co-operation with the British Medical Research Council. In Honduras, a short colour film was made on the eradication, using sterile-male techniques, of the torsalo fly, which infests livestock. Television shorts were also made from all these films.

ANNEX A

THE BOARD OF GOVERNORS

To 2 October 1967	1967-1968	From 2 October 1967
		Algeria <sup>a/</sup>
	Argentina <sup>b/ c/</sup>	
	Australia <sup>b/ c/</sup>	
Austria <sup>d/</sup>		
Belgium <sup>e/</sup>		
	Brazil <sup>f/</sup>	
	Canada <sup>b/ c/</sup>	Bulgaria <sup>a/</sup>
		Ceylon <sup>a/</sup>
Colombia <sup>d/</sup>		
		Czechoslovak Socialist Republic <sup>g/</sup>
Denmark <sup>e/</sup>	France <sup>b/ c/</sup>	
	Germany, Federal Republic of <sup>f/</sup>	
Ghana <sup>d/</sup>		
	India <sup>b/ c/</sup>	
	Indonesia <sup>f/</sup>	
	Japan <sup>b/ c/</sup>	
Korea, Republic of <sup>d/</sup>		
	Lebanon <sup>f/</sup>	
	Mexico <sup>f/</sup>	Madagascar <sup>a/</sup>
		Norway <sup>g/</sup>
Pakistan <sup>d/</sup>		Peru <sup>a/</sup>
		Philippines <sup>a/</sup>
Poland <sup>e/</sup>		Portugal <sup>g/</sup>
	South Africa <sup>b/ c/</sup>	
Tunisia <sup>d/</sup>		Turkey <sup>a/</sup>

Union of Soviet Socialist  
Republics<sup>b/ c/</sup>

United Kingdom of Great Britain and  
Northern Ireland<sup>b/ c/</sup>

United States of America<sup>b/ c/</sup>

Yugoslavia<sup>d/</sup>

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- a/ Elected by the General Conference on 2 October 1967 under Article VI. A. 3 of the Statute.
- b/ Designated by the Board on 15 June 1966 under Article VI. A. 1 of the Statute.
- c/ Designated by the Board on 16 June 1967 under Article VI. A. 1 of the Statute.
- d/ Elected by the General Conference on 27 September 1965 under Article VI. A. 3 of the Statute.
- e/ Designated by the Board on 15 June 1966 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 BY  
MEMBER STATES IN 1967

Member State	Number of fellowships	
	Offered	Utilized <sup>a/</sup>
<b>I. <u>Country programme</u></b>		
Argentina	5	3
Austria	3	2
Belgium	6	3
Brazil	10	1
China	2	-
Czechoslovak Socialist Republic	9	2
Denmark	5	4
Germany, Federal Republic of	6	3
Hungary	4	-
India	10	9
Israel	5 <sup>b/</sup>	2
Italy	20 <sup>c/</sup>	17
Japan	10	10
Mexico	1	-
Netherlands	8	8
Pakistan	5	-
Poland	5	-
Romania	d/	1
Spain	5	4
Sweden	2	2
Switzerland	2	-
Tunisia	2	-
Union of Soviet Socialist Republics	20	11
United States of America	40	52 <sup>e/</sup>
Yugoslavia	5	3
	190	137
<b>II. <u>International programme</u></b>		
Joint Institute for Nuclear Research (JINR) at Dubna, Soviet Union	3	1
Total	193	138

<sup>a/</sup> Number of awards less rejections and withdrawals.

<sup>b/</sup> On the basis on nine man-months per fellowship; the offer was for a total of 45 man-months.

<sup>c/</sup> On the basis of eight man-months per fellowship; the offer was for a total of 160 man-months.

<sup>d/</sup> Thirteen openings were available in 1967, as a carry-over from the offer made in 1965.

<sup>e/</sup> Includes awards financed out of prior years' savings.

ANNEX C

RESEARCH CONTRACTS

I. Total value of contracts in 1967

Year	New contracts	Renewals	Total	Value
1967	58	106	164	758 649

II. Analysis by subject matter of contracts awarded or renewed in 1967

Subject matter of research	Number of contracts placed	Number of contracts renewed	Agency contribution
Radioactive waste management and environmental research	3	10	96 770
Health physics and radiation protection	3	4	32 550
Radiation biology	7	16	79 204
Studies involving reactors	6	8	116 840 <sup>a/</sup>
Radioisotope applications in agriculture	21	32	180 870
Food irradiation	4	7	41 950
Radioisotope applications in hydrology	5	4	51 275
Radioisotope applications in industry	2	4	22 700
Radioisotope applications in medicine	7	21	136 490
Total	58	106	758 649

<sup>a/</sup> Including \$31 000 for a combined reactor and safeguards study, half the cost being met from funds available for safeguards development.

III. Analysis by country of contracts awarded or renewed in 1967

Country	Number of contracts placed	Number of contracts renewed	Agency contribution
Argentina	-	5	17 454
Australia	2	2	15 250
Austria	1	2	14 500
Belgium	-	2	4 500
Bolivia	-	1	6 000
Brazil	3	3	24 835
Bulgaria	1	1	10 050
Ceylon	1	1	5 500
Chile	1	-	4 000
China	3	2	21 100
Colombia	1	1	6 000
Czechoslovak Socialist Republic	-	1	9 840
Denmark	-	2	7 000
Ecuador	1	-	6 000
El Salvador	-	1	6 000
France	-	1	3 400
Germany, Federal Republic of	1	2	11 800
Ghana	1	1	9 300
Greece	-	2	9 500
Hungary	6	7	77 500
India	3	3	24 700
Iran	1	-	5 650
Iraq	-	3	14 100
Israel	1	4	24 200
Italy	2	1	14 100
Japan	1	6	31 450
Kenya	2	2	16 700
Korea, Republic of	3	7	36 800
Lebanon	1	2	12 450
Madagascar	-	1	4 000
Mexico	-	1	3 350
Netherlands	2	2	16 100
Pakistan	3	4	25 500
Peru	-	1	3 000
Philippines	-	5	17 025
Poland	3	4	26 750
Portugal	2	-	11 000
Romania	4	2	31 125
South Africa	-	1	4 550
Spain	3	2	21 000

Country	Number of contracts placed	Number of contracts renewed	Agency contribution
Thailand	1	-	2 000
Turkey	-	5	20 250
Union of Soviet Socialist Republics	-	1	9 780
United Arab Republic	1	8	39 800
United Kingdom of Great Britain and Northern Ireland	1	1	13 900
United States of America	1	-	31 000
Uruguay	-	1	7 000
Yugoslavia	1	2	21 840
Total	58	106	758 649



A N N E X D

CONFERENCES, SYMPOSIA AND SEMINARS HELD  
DURING THE PERIOD 1 JULY 1967-30 JUNE 1968

Date and place	Title	Co-sponsoring organizations	Number of participants	Number of countries represented	Number of organizations represented	Number of papers presented
<u>1967</u>						
3-7 July Vienna	Symposium on Instruments and Techniques for the Assessment of Airborne Radioactivity in Nuclear Operations		139	24	3	56
17-21 July Ann Arbor, (United States of America)	Symposium on Neutron Thermalization and Reactor Spectra		143	24	1	71
28 August-1 September Vienna	Symposium on the Use of Isotopes in Studies of Nitrogen Metabolism in the Soil-Plant-Animal System	FAO ICSU/ JCAR	48	17	1	23
4-8 September Vienna	Symposium on Thermodynamics of Nuclear Materials with Emphasis on Solution Systems		101	16	1	54
11-15 September Vienna	Symposium on Heavy-Water Power Reactors		225	28	3	59
9-13 October London	Symposium on International Extrapolation and Comparison of Nuclear Power Costs		195	32	7	21
30 October-3 November Karlsruhe (Federal Republic of Germany)	Symposium on Fast Reactor Physics and Related Safety Problems		183	23	3	64

Date and place	Title	Co-sponsoring organizations	Number of participants	Number of countries represented	Number of organizations represented	Number of papers presented
4-8 December Vienna	Symposium on the Use of Isotopes and Radiation in Entomology	FAO	82	29	6	33
<u>1968</u>						
1-5 April Monaco	Symposium on the Effect of Radiation on Cellular Proliferation and Differentiation	ICSU/ JCAR	105	20	3	40
20-25 May Copenhagen	Symposium on Neutron Inelastic Scattering		168	27	3	99
27-31 May Gottwaldov (Czechoslovak Socialist Republic)	Symposium on Economics of Nuclear Fuels		177	29	6	35

ANNEX E

FINANCE

1. Status of the Working Capital Fund, the supplementary contributions to the 1966 Regular Budget and the 1968 Regular Budget contributions

Member State	Working Capital Fund			1966 supplementary contributions			1968 Regular Budget contributions			
	Assessed \$	Paid \$	Outstanding \$	Assessed \$	Paid \$	Outstanding \$	Assessed \$	Credits \$	Paid \$	Outstanding \$
Afghanistan	1 000	1 000	-	120	-	120	5 082	-	-	5 082
Albania	800	800	-	96	-	96	4 065	25	-	4 040
Algeria	1 800	1 800	-	216	216	-	9 147	57	9 090	-
Argentina	16 600	16 600	-	1 990	-	1 990	84 357	591	-	83 766
Australia	28 400	28 400	-	3 405	3 405	-	144 322	972	71 189	72 161
Austria	9 600	9 600	-	1 151	1 151	-	48 785	261	48 524	-
Belgium	20 600	20 600	-	2 494	2 494	-	104 684	699	103 985	-
Bolivia	800	800	-	96	-	96	4 065	25	-	4 040
Brazil	17 000	17 000	-	2 062	-	2 062	86 390	804	-	85 586
Bulgaria	3 000	3 000	-	360	-	360	15 245	115	-	15 130
Burma	1 000	1 000	-	120	-	120	5 082	38	-	5 044
Byelorussian Soviet Socialist Republic	9 400	9 400	-	1 127	1 127	-	47 769	305	23 273	24 191
Cambodia	800	800	-	96	-	96	4 065	25	-	4 040
Cameroon	800	800	-	96	96	-	4 065	25	4 040	-
Canada	57 000	57 000	-	6 858	6 858	-	289 660	1 823	287 837	-
Ceylon	1 400	1 400	-	168	-	168	7 115	51	-	7 064
Chile	4 800	4 800	-	575	-	575	24 393	153	-	24 240
China	76 400	76 400	-	9 184	-	9 184	388 246	2 668	-	385 578
Colombia	4 200	4 200	-	503	503	-	21 343	153	21 190	-
Congo, Democratic Republic of the	1 000	1 000	-	120	-	120	5 082	93	-	4 989
Costa Rica	800	800	-	96	-	96	4 065	25	-	4 040
Cuba	3 600	3 600	-	432	-	432	18 294	127	-	18 167
Cyprus	800	800	-	96	96	-	4 065	25	4 040	-
Czechoslovak Socialist Republic	20 000	20 000	-	2 398	2 398	-	101 635	610	-	101 025
Denmark	11 200	11 200	-	1 343	1 343	-	56 916	337	56 579	-
Dominican Republic	800	800	-	96	-	96	4 065	-	-	4 065
Ecuador	1 000	1 000	-	120	-	120	5 082	-	-	5 082
El Salvador	800	800	-	96	-	96	4 065	25	-	4 040
Ethiopia	800	800	-	96	-	96	4 065	-	-	4 065
Finland	7 800	7 800	-	935	935	-	39 638	216	39 422	-
France	109 600	109 600	-	13 164	13 164	-	556 960	3 475	553 485	-
Gabon	800	800	-	96	96	-	4 065	25	4 040	-
Germany, Federal Republic of	133 400	133 400	-	16 018	16 018	-	677 906	3 329	329 280	345 297
Ghana	1 400	1 400	-	168	-	168	7 115	51	-	7 064
Greece	4 400	4 400	-	551	276	275	22 360	334	4 326	17 700
Guatemala	800	800	-	96	-	96	4 065	-	-	4 065
Haiti	800	800	-	96	-	96	4 065	-	-	4 065
Holy See <sup>a/</sup>	800	800	-	96	96	-	4 065	25	4 040	-
Honduras <sup>a/</sup>	-	-	-	96	-	96	-	-	-	-
Hungary	10 000	10 000	-	1 199	-	1 199	50 818	299	-	50 519

Member State	Working Capital Fund			1966 supplementary contributions			1968 Regular Budget contributions			
	Assessed	Paid	Outstanding	Assessed	Paid	Outstanding	Assessed	Credits	Paid	Outstanding
	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$
Iceland	800	800	-	96	96	-	4 065	25	4 040	-
India	33 400	33 400	-	4 004	4 004	-	169 730	1 188	168 542	-
Indonesia	7 000	7 000	-	839	-	839	35 572	261	-	35 311
Iran	3 600	3 600	-	432	-	432	18 294	115	-	18 179
Iraq	1 400	1 400	-	168	-	168	7 115	51	-	7 064
Israel	3 000	3 000	-	360	-	360	15 245	89	-	15 156
Italy	45 800	45 800	-	5 491	-	5 491	232 744	1 309	-	231 435
Ivory Coast	800	800	-	96	96	-	4 065	25	4 040	-
Jamaica	1 000	1 000	-	120	120	-	5 082	32	5 050	-
Japan	49 800	49 800	-	5 995	5 995	-	253 071	1 328	251 743	-
Jordan	800	800	-	96	-	96	4 065	-	-	4 065
Kenya	800	800	-	96	96	-	4 065	25	4 040	-
Korea, Republic of	2 400	2 400	-	288	288	-	12 196	108	12 088	-
Kuwait	1 000	1 000	-	120	120	-	5 082	25	5 057	-
Lebanon	1 000	1 000	-	120	120	-	5 082	32	5 050	-
Liberia	800	800	-	96	-	96	4 065	25	-	4 040
Libya	800	800	-	96	96	-	4 065	25	4 040	-
Luxembourg	1 000	1 000	-	120	-	120	5 082	32	-	5 050
Madagascar	800	800	-	96	96	-	4 065	25	4 040	-
Mali	800	800	-	96	-	96	4 065	-	-	4 065
Mexico	14 600	14 600	-	1 750	-	1 750	74 194	432	-	73 762
Monaco	800	800	-	96	96	-	4 065	25	4 040	-
Morocco	2 000	2 000	-	240	240	-	10 164	83	10 081	-
Netherlands	20 000	20 000	-	2 398	2 398	-	101 635	591	101 044	-
New Zealand	6 800	6 800	-	815	815	-	34 556	242	34 314	-
Nicaragua	800	800	-	96	-	96	4 065	25	-	4 040
Nigeria	3 000	3 000	-	360	-	360	15 245	121	-	15 124
Norway	8 000	8 000	-	959	959	-	40 654	261	40 393	-
Pakistan	6 600	6 600	-	791	791	-	33 540	248	16 250	17 042
Panama	800	800	-	96	-	96	4 065	-	-	4 065
Paraguay	800	-	800	96	-	96	4 065	-	-	4 065
Peru	1 600	1 600	-	192	-	192	8 131	57	-	8 074
Philippines	6 200	6 200	-	743	-	743	31 507	235	-	31 272
Poland	26 200	26 200	-	3 141	3 141	-	133 142	750	57 067	75 325
Portugal	2 600	2 600	-	336	336	-	13 213	295	12 918	-
Romania	6 200	6 200	-	743	743	-	31 507	184	12 976	18 347
Saudi Arabia	1 200	1 200	-	144	144	-	6 098	38	6 060	-
Senegal	800	800	-	96	96	-	4 065	32	699	3 334
Sierra Leone	800	-	800	-	-	-	4 065	-	-	4 065
Singapore	800	800	-	-	-	-	4 065	-	4 065	-
South Africa	9 400	9 400	-	1 127	1 127	-	47 769	311	47 458	-
Spain	13 200	13 200	-	1 583	-	1 583	67 079	502	-	66 577
Sudan	1 000	1 000	-	120	-	120	5 082	38	-	5 044
Sweden	22 600	22 600	-	2 734	-	2 734	114 848	763	-	114 085
Switzerland	15 800	15 800	-	1 894	1 894	-	80 292	553	79 739	-

Member State	Working Capital Fund			1966 supplementary contributions			1968 Regular Budget contributions			
	Assessed \$	Paid \$	Outstanding \$	Assessed \$	Paid \$	Outstanding \$	Assessed \$	Credits \$	Paid \$	Outstanding \$
Syrian Arab Republic	1 000	1 000	-	120	-	120	5 082	32	-	5 050
Thailand	2 600	2 600	-	312	312	-	13 213	95	13 118	-
Tunisia	1 000	1 000	-	120	120	-	5 082	32	4 250	800
Turkey	6 200	6 200	-	743	743	-	31 507	235	31 272	-
Ukrainian Soviet Socialist Republic	35 400	35 400	-	4 244	4 244	-	179 894	1 156	87 156	91 582
Union of Soviet Socialist Republics	268 600	268 600	-	32 228	32 228	-	1 364 958	8 748	661 972	694 238
United Arab Republic	4 200	4 200	-	503	-	503	21 343	146	-	21 197
United Kingdom of Great Britain and Northern Ireland	129 800	129 800	-	15 586	-	15 586	659 611	4 428	-	655 183
United States of America	637 200	637 200	-	76 518	-	76 518	3 238 092	20 428	-	3 217 664
Uruguay	1 800	1 800	-	216	-	216	9 147	-	-	9 147
Venezuela	9 000	9 000	-	1 079	-	1 079	45 736	305	-	45 431
Viet-Nam	1 400	1 400	-	168	168	-	7 115	95	7 020	-
Yugoslavia	6 400	6 400	-	767	767	-	32 523	223	24 066	8 234
<b>Sub-total</b>	<b>2 000 000</b>	<b>1 998 400</b>	<b>1 600</b>	<b>240 104</b>	<b>112 761</b>	<b>127 343</b>	<b>10 163 500</b>	<b>64 215</b>	<b>3 288 028</b>	<b>6 811 257</b>
<b><u>New Member</u></b>										
Uganda	800	-	800	-	-	-	4 065	-	-	4 065
<b>TOTAL</b>	<b>2 000 800</b>	<b>1 998 400</b>	<b>2 400</b>	<b>240 104</b>	<b>112 761</b>	<b>127 343</b>	<b>10 167 565</b>	<b>64 215</b>	<b>3 288 028</b>	<b>6 815 322</b>

a/ Withdrawn on 19 June 1967

2. Outstanding contributions to the Regular Budgets for 1958-1967

Member State	1958 \$	1959 \$	1960 \$	1961 \$	1962 \$	1963 \$	1964 \$	1965 \$	1966 \$	1967 \$	Total \$
Afghanistan	-	-	-	-	-	-	3 343	3 857	4 213	4 587	16 000
Argentina	-	-	-	-	-	-	-	-	9 568	76 144	85 712
Bolivia	-	-	-	-	-	-	-	-	3 019	3 670	6 689
Cambodia	-	-	-	-	-	-	-	-	-	3 532	3 532
Chile	-	-	-	-	-	-	-	-	-	15 394	15 394
China	-	-	-	-	-	-	-	-	322 735	350 447	673 182
Costa Rica	-	-	-	-	-	-	-	-	-	3 670	3 670
Cuba	-	-	-	-	-	-	-	-	14 641	16 513	31 154
Dominican Republic	-	-	-	-	3 015	3 561	3 610	3 857	3 371	3 670	21 084
Ecuador	-	-	-	-	-	-	-	-	2 695	4 587	7 282
El Salvador	-	-	-	-	-	-	-	-	-	3 532	3 532
Ethiopia	-	-	-	-	-	-	-	3 684	3 371	3 670	10 725
Ghana	-	-	-	-	-	-	-	-	2 557	6 422	8 979
Guatemala	-	-	-	-	-	-	-	3 046	3 371	3 670	10 087
Haiti	-	2 021	2 337	2 467	2 652	2 849	2 888	3 085	3 371	3 670	25 340
Honduras	-	-	-	1 070	2 652	2 849	2 888	3 085	3 371	3 670	19 585
Hungary	-	-	-	-	-	-	-	-	40 402	45 870	86 272
Iran	-	-	-	-	-	-	-	-	-	2 630	2 630
Jordan	-	-	-	-	-	-	-	-	-	3 670	3 670
Mali	-	-	-	-	-	-	-	1 792	3 371	3 670	8 833
Nicaragua	-	-	-	-	-	-	-	-	2 794	3 670	6 464
Panama	-	-	-	-	-	-	-	-	-	3 670	3 670
Paraguay	1 636	2 090	2 337	2 467	2 652	2 849	2 888	3 085	3 371	3 670	27 045
Peru	-	-	-	-	-	-	-	-	5 388	7 339	12 727
Sierra Leone	-	-	-	-	-	-	-	-	-	3 670	3 670
Uganda	-	-	-	-	-	-	-	-	-	3 670	3 670
Uruguay	-	-	-	-	-	-	-	5 679	7 584	8 256	21 519
Venezuela	-	-	-	-	-	-	-	-	-	39 626	39 626
Total due	1 636	4 111	4 674	6 004	10 971	12 108	15 617	31 170	439 193	636 259	1 161 743
Total paid	4 113 124	5 220 889	5 876 306	6 194 686	6 629 108	7 143 155	7 214 657	7 201 112	7 998 262	8 548 751	66 140 050
Total assessed	4 114 760	5 225 000	5 880 980	6 200 690	6 640 079	7 155 263	7 230 274	7 232 282	8 437 455	9 185 010	67 301 793
Percentage paid of assessment	99.96	99.92	99.92	99.90	99.83	99.83	99.78	99.57	94.79	93.07	98.27

### 3. Voluntary contributions to the General Fund for 1967 and 1968

Member State	Pledged (equivalent in United States dollars at UNDP rates)		Paid	
	1967	1968	1967	1968
Argentina	16 600 <sup>a/</sup>	16 600 <sup>a/</sup>	-	-
Australia	20 000	28 400 <sup>ad/</sup>	20 000	20 000
Austria	9 600 <sup>a/</sup>	9 600 <sup>a/</sup>	9 600	9 600
Belgium	10 000	-	10 000	-
Bolivia	800 <sup>a/</sup>	-	-	-
Brazil	17 200 <sup>ab/</sup>	17 000 <sup>a/</sup>	-	-
Bulgaria	2 500 <sup>b/</sup>	2 500 <sup>b/</sup>	2 500	-
Burma	1 000 <sup>ab/</sup>	1 000 <sup>a/</sup>	1 000	-
Cambodia	800 <sup>a/</sup>	800 <sup>a/</sup>	-	-
Canada	57 000 <sup>a/</sup>	57 000 <sup>a/</sup>	57 000	-
Ceylon	2 100 <sup>ab/</sup>	1 680 <sup>ab/</sup>	2 100	1 680
Chile	5 000 <sup>a/</sup>	5 000 <sup>a/</sup>	5 000	-
China	5 000	10 000	5 000	-
Colombia	1 500	-	1 500	-
Congo, Democratic Republic of the	1 000 <sup>a/</sup>	1 000 <sup>a/</sup>	1 000	-
Cyprus	-	280	-	280
Czechoslovak Socialist Republic	13 889 <sup>b/</sup>	20 833 <sup>ab/</sup>	13 889	20 833
Denmark	11 200 <sup>a/</sup>	11 200 <sup>a/</sup>	11 200	11 200
Ecuador	1 000	-	-	-
Finland	7 800 <sup>a/</sup>	12 000 <sup>a/</sup>	7 800	12 000
France	30 612	30 612	30 612	30 612
Germany, Federal Republic of	133 400 <sup>a/</sup>	133 400 <sup>a/</sup>	133 400	66 700
Ghana	1 400 <sup>a/</sup>	1 400 <sup>ab/</sup>	1 400	-
Greece	4 600 <sup>a/</sup>	4 400 <sup>a/</sup>	-	-
Guatemala	1 000 <sup>ab/</sup>	-	500	-
Holy See	2 000 <sup>a/</sup>	2 000 <sup>a/</sup>	2 000	2 000
Hungary	4 259 <sup>b/</sup>	4 259 <sup>b/</sup>	4 259	-
Iceland	800 <sup>a/</sup>	-	800	-
India	35 000 <sup>ab/</sup>	35 000 <sup>ab/</sup>	35 000	35 000
Indonesia	2 000	3 000	2 000	3 000
Iran	-	2 000	-	-
Iraq	1 400 <sup>a/</sup>	1 400 <sup>a/</sup>	1 400	-
Israel	3 000 <sup>ab/</sup>	3 000 <sup>ab/</sup>	3 000	3 000
Italy	45 800 <sup>a/</sup>	-	45 800	-
Ivory Coast	-	803 <sup>a/</sup>	-	803
Japan	49 800 <sup>a/</sup>	49 800 <sup>a/</sup>	49 800	49 800
Korea, Republic of	2 400 <sup>a/</sup>	2 400 <sup>a/</sup>	2 400	2 400
Kuwait	-	1 500 <sup>a/</sup>	-	1 000
Lebanon	1 000 <sup>a/</sup>	1 000	1 000	1 000
Madagascar	800 <sup>a/</sup>	800 <sup>a/</sup>	800	-
Mexico	14 600 <sup>a/</sup>	16 500 <sup>a/</sup>	-	-
Monaco	2 000 <sup>a/</sup>	2 000 <sup>a/</sup>	2 000	2 000
Morocco	2 000 <sup>a/</sup>	2 000 <sup>a/</sup>	2 000	-
Netherlands	20 000 <sup>a/</sup>	20 000 <sup>a/</sup>	20 000	20 000
New Zealand	5 000	6 800 <sup>a/</sup>	5 000	6 800

Member State	Pledged (equivalent in United States dollars at UNDP rates)		Paid	
	1967	1968	1967	1968
	Norway	8 000 <sup>a/</sup>	8 000 <sup>a/</sup>	8 000
Pakistan	6 000 <sup>b/</sup>	6 000 <sup>b/</sup>	6 000	6 000
Philippines	6 200 <sup>ab/</sup>	6 200 <sup>ab/</sup>	6 200	-
Poland	4 167 <sup>b/</sup>	6 250 <sup>b/</sup>	-	-
Portugal	3 600 <sup>a/</sup>	3 600 <sup>a/</sup>	3 600	3 600
Romania	6 200 <sup>ac/</sup>	6 200 <sup>ac/</sup>	6 200	6 200
Saudi Arabia	1 200 <sup>a/</sup>	1 200 <sup>a/</sup>	1 200	1 200
Singapore	-	800 <sup>a/</sup>	-	800
South Africa	9 400 <sup>a/</sup>	9 400 <sup>a/</sup>	9 400	9 400
Spain	10 000	10 000	10 000	-
Sweden	22 600 <sup>a/</sup>	22 600 <sup>a/</sup>	22 600	-
Switzerland	15 800 <sup>a/</sup>	15 800 <sup>a/</sup>	15 800	15 800
Thailand	3 000 <sup>a/</sup>	3 000 <sup>a/</sup>	3 000	3 000
Turkey	6 200 <sup>a/</sup>	6 200 <sup>a/</sup>	6 200	6 200
Union of Soviet Socialist Republics	111 111 <sup>b/</sup>	111 111 <sup>b/</sup>	111 111	111 111
United Arab Republic	11 500 <sup>ab/</sup>	11 500 <sup>ab/</sup>	11 500	-
United Kingdom of Great Britain and Northern Ireland	110 000	110 000	110 000	-
Uruguay	2 000 <sup>a/</sup>	-	2 000	-
Venezuela	9 000 <sup>a/</sup>	9 000 <sup>a/</sup>	-	-
Viet-Nam	1 400 <sup>ab/</sup>	1 400 <sup>ab/</sup>	1 400	-
Yugoslavia	6 400 <sup>ab/</sup>	8 000 <sup>ab/</sup>	6 400	8 000
	900 638	875 228	831 371	479 019
United States of America (including matching contribution)	540 383 <sup>e/</sup>	471 277 <sup>f/</sup>	456 283	-
Total	1 441 021	1 346 505	1 287 654	479 019

<sup>a/</sup> Pledge based on a percentage equal to or higher than the Member's percentage assessment under the 1967 and 1968 Regular Budgets.

<sup>b/</sup> Pledged in local currency.

<sup>c/</sup> Romania pledged 90% in local currency.

<sup>d/</sup> \$8 400 of this sum is pledged in local currency for use in Australia.

<sup>e/</sup> Equivalent to 37.5% of the total pledged by all Member States including the United States.

<sup>f/</sup> Equivalent to 35% of the total pledged by all Member States including the United States.