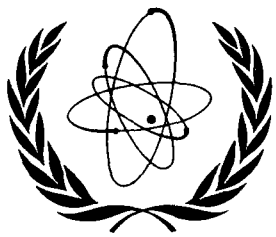

International Atomic Energy Agency

ANNUAL REPORT TO THE ECONOMIC AND SOCIAL COUNCIL OF THE UNITED NATIONS FOR 1960-61

INFCIRC/28

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THE AGENCY'S ANNUAL REPORT TO THE ECONOMIC AND SOCIAL COUNCIL OF THE UNITED NATIONS FOR 1960-61

The text of the Agency's annual report to the Economic and Social Council of the United Nations for 1960-61 is reproduced in this document for the information of all Members.

ANNUAL REPORT BY THE INTERNATIONAL ATOMIC ENERGY AGENCY TO THE ECONOMIC AND SOCIAL COUNCIL FOR 1960-61

(For the period 16 April 1960 - 31 March 1961)

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List of Abbreviations

ACC	Administrative Committee on Co-ordination
Agency	International Atomic Energy Agency
CCAQ	Consultative Committee on Administrative Questions
CCPI	Consultative Committee on Public Information
CCTA	Commission for Technical Co-operation in Africa South of the Sahara
CERN	European Organization for Nuclear Research
ECA	United Nations Economic Commission for Africa
ECAFE	United Nations Economic Commission for Asia and the Far East
ECE	United Nations Economic Commission for Europe
ECLA	United Nations Economic Commission for Latin America
ECOSOC	Economic and Social Council of the United Nations
ENEA	European Nuclear Energy Agency of the Organisation for European Economic Co-operation
EPA	European Productivity Agency of the Organisation for European Economic Co-operation
EPTA	United Nations Expanded Programme of Technical Assistance
EURATOM	European Atomic Energy Community
FAO	Food and Agriculture Organization of the United Nations
IANEC	Inter-American Nuclear Energy Commission of the Organization of American States
IBRD	International Bank for Reconstruction and Development
IBWM	International Bureau of Weights and Measures
ICAO	International Civil Aviation Organization
ICRP	International Commission on Radiological Protection
ICRU	International Committee on Radiological Units and Measurements
ICSU	International Council of Scientific Unions
ILO	International Labour Organisation or International Labour Office
IMCO	Inter-Governmental Maritime Consultative Organization
OAS	Organization of American States

List of Abbreviations (continued)

OEEC	Organisation for European Economic Co-operation
SCOR	Special Committee on Oceanic Research of the International Council of Scientific Unions
TAB	Technical Assistance Board
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
WHO	World Health Organization
WMO	World Meteorological Organization

NOTE

All sums of money are expressed in United States dollars.

INTRODUCTION

General

1. The following report is submitted to ECOSOC in pursuance of Council resolution 694 E (XXVI), and resolutions GC(II)/RES/24 and GC(IV)/RES/63 of the General Conference of the International Atomic Energy Agency.

2. The Board of Governors has borne in mind the fact that the Agency has already submitted to the General Assembly of the United Nations a comprehensive report on the Agency's work from 1 July 1959 to 30 June 1960 and a supplement covering the period 1 July 1960 to 30 September 1960. [1] The present report is therefore concentrated on those aspects of the Agency's work of particular interest to the Council, and as in previous reports, account has been taken of the Council's special responsibility for co-ordinating the activities of the United Nations family in the economic and social fields.

3. The Board is pleased to inform the Council that since its last report the membership of the Agency has increased from 70 to 74. The new members are Chile, Colombia, Ghana and Senegal.

Main trends in the Agency's work in 1960-61

4. Most of the Agency's program is now firmly established and 1961 is generally expected to be a year of consolidation. The scope and nature of the Agency's operations continue to be determined largely by the rate of advance of nuclear technology, and particularly by its extension in the less-developed areas. Another factor of obvious importance is the extent to which the Agency may be able to serve as a medium for scientific co-operation between the leading nuclear powers, but this is dependent on factors outside the scope of the present report.

5. The three main aspects of nuclear technology with which the Agency deals are of particular interest to the Council because of their impact on economic and social development. These are:

(a) Nuclear power;

(b) The use of radioisotopes and radiation; and

(c) Protection against radiation hazards.

6. There has been no substantial change in the prospects for nuclear power since the last report but there have been a number of interesting developments. Several large nuclear power stations have come into operation in various countries, bringing the world's total electrical energy resources available from nuclear power stations already installed to approximately one million kilowatts. Twenty-eight nuclear plants, with a total capacity of 4.3 million kilowatts are under construction. Despite inevitable "teething troubles" it has been proved that nuclear power is a technically sound, reliable and safe means for generating electricity.

7. The cost of producing nuclear power is decreasing faster than that of producing conventional power and it is accepted in several countries that large nuclear power plants of proven types will become economically competitive with conventional plants before the end of the decade. New types of power reactors still at the experimental or prototype stage may also show more radical cost reductions in the future.

8. The main advances in the use of nuclear power have been in highly industrialized countries which are largely self-sufficient or have made regional or special arrangements for scientific manpower, industrial equipment and the supply of nuclear fuels. The

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[1] United Nations documents A/4531 and Add. 1.

Agency's role has therefore largely been that of studying the economics of nuclear power and particularly methods of assessing and comparing its cost. It has also promoted contacts among scientists and stimulated the exchange of information and research and development. Its work in the less-developed areas has consisted largely of helping to train personnel and providing technical assistance to new small reactor facilities.

9. With respect to the second main peaceful use of atomic energy, radioisotopes and radiation, there has been much further advance in the last year and wider applications are constantly being developed and established applications are being expanded. The various uses of radioisotopes and radiation have therefore, as in previous years, been the subject of a very substantial part of the Agency's work and it has been able to record reasonable progress in promoting their employment under safe conditions, in the less-developed areas. Thus over one quarter of the fellowships awarded, about one half of the experts sent out, and approximately three quarters of the research contracts awarded have been concerned with radioisotopes and radiation in one form or another. Radioisotopes and radiation have also figured prominently as subjects of the Agency's scientific information program. Six of the Agency's scientific meetings in 1960, including the largest (the Conference on the Use of Radioisotopes in the Physical Sciences and Industry held at Copenhagen), also dealt with these subjects.

10. The need for adequate protection against radiation hazards and for finding safe means of disposal of radioactive wastes becomes greater each year as more reactors come into operation in various parts of the world and as radioisotope radiation techniques become standard tools in the hands of research and industrial workers, agriculturists and doctors. The Agency's work on nuclear safety has thus continued to expand.

11. The continued growth in 1960 of the Agency's work in these scientific and technical subjects has had a considerable impact on its programs for the exchange of information, technical co-operation and promotion of research.

12. During 1960 the Agency held 12 scientific meetings attended by nearly two thousand participants from 54 Member States. Some fifty scientific and technical publications were issued on projects ranging from methods of prospecting for nuclear raw materials to plasma physics and nuclear fusion. The Agency continued to provide technical information to Member States and compile surveys on specific problems at their request.

13. The total value of technical assistance made available by the Agency in the form of equipment, including equipment donated to the Agency, experts and fellowships, including free fellowships, can be estimated at $2 820 000 for 1960. Technical equipment and supplies to the value of over $400 000 were provided in connection with technical assistance projects, and 40 experts were in the field. Under the 1960 fellowship program, 648 applications were received and 468 candidates were selected for awards. The 1000th Agency fellowship candidate was selected for an award in December 1960.[2] Two regional or international training courses were organized in 1960 and five have been planned for 1961. A decision was also taken in connection with the establishment of the first Agency regional training center (in Cairo) subject to various conditions which are outlined in paragraph 148 below. The two Agency mobile laboratories have continued to provide training courses in Latin America and the Far East.

14. Under the Agency's program for promoting research and development, 76 research contracts were awarded to a value of $565 819 during the period under review. By the end of 1960 one hundred contracts had been awarded since the beginning of the program.

Africa

15. Like other members of the United Nations family the Agency is giving attention to the needs of newly independent States in Africa. The first composite Agency survey mission

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[2] From the inception of the fellowship program until the end of 1960, 203 fellows had completed their studies. At the latter date, a further 306 were studying. See paragraph 139 below.

(preliminary assistance mission) to be sent to that continent visited the Ivory Coast, the then Federation of Mali, Morocco, Sudan and Tunisia in 1960, and a smaller mission surveyed the question of establishing a regional radioisotope training center in the area. The first radioisotope training course on that continent for which the Agency provided some assistance was held in Leopoldville in May-June 1960.[3]

16. In most of Africa the most urgent and vital need is for the basic means of economic and social development and the complex technology of atomic energy is likely to play a limited role for some time to come. It is foreseen therefore that the greater part of the Agency's initial work in these countries will be in the form of helping them to exploit nuclear raw materials, training technicians and scientists, and providing assistance to the relatively few and scattered institutions in which nuclear science can as yet play an effective role. However, it is clear from the meetings of various United Nations bodies that these countries will look increasingly to international organizations and particularly to those of the United Nations family to assist them in developing all parts of their national economies. Progress in secondary and higher education, health services, industrialization and the scientific exploitation of agricultural resources, as well as growth in the demand for power, will in time bring increasing scope for the application of nuclear science and atomic energy techniques and with it an increased role for the Agency.

Program appraisal

17. The consolidated report of the Council's Committee on Program Appraisals[4] was considered by the Board in February. Pursuant to the Council's request,[5] the Board's observations on the report and an indication of the extent to which the trends foreseen in the Agency's appraisal are being realized, are dealt with in Part Three of this report.

Co-ordination

18. ACC will report separately to the Council on the co-ordination of the United Nations family on activities relating to atomic energy. The subject is therefore dealt with only briefly in this report. On the whole, satisfactory progress has been achieved in the past year. The seventh relationship agreement with a specialized agency (IMCO) will be submitted to the General Conference for its approval early in October 1961. Relationship agreements have also been concluded with two inter-governmental organizations. This development reflects the increasing need and importance of co-ordinating the rapidly growing volume of work of regional bodies as well as of the Agency in the nuclear energy field.

19. These agreements and the supplementary arrangements concluded under them provide the framework for co-operation. Close contacts at the working level are essential to implement them. These exist with the United Nations and with all other agencies concerned with one or other application of nuclear science. They have borne fruit in numerous ways described in the reports of ACC; the Agency has for instance received valuable comments from FAO, UNESCO and WHO on special aspects of its technical assistance program. They have also resulted in several projects for concerted action in the form of co-sponsorship of training courses, symposia, seminars and large scientific conferences.

Finance

20. The following table shows the total amounts approved for the Agency's budget for 1960 and 1961.

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[3] See paragraphs 70 and 145 below.

[4] United Nations document E/3347/Rev.1.

[5] See Council resolution 791 (XXX).

	1960	1961
	$	$
Regular budget	5 843 000	6 168 000
Operational budget	1 500 000	1 800 000
Total	7 343 000	7 968 000

The Agency's own program of technical assistance (including fellowships) and other important activities are dependent upon voluntary contributions to its General Fund. The failure since 1958 of these contributions to reach the target set by the Agency's General Conference represents the most serious financial problem facing the Agency and has been recognized by the General Assembly in its resolution 1531 (XV). The problem has been partly alleviated by participation in EPTA, but the Agency's percentage share in EPTA resources, although it has risen from 1.1 in 1959 to 2.1 in 1961-62, is still modest. While this may be partly due to delays in the development of nuclear science programs in less-developed areas it also doubtless reflects the difficulties with which a new program must contend in competing with established activities and previously approved long-term projects.

21. No request for an atomic energy project has yet been formally submitted to the Special Fund. Nuclear science techniques, however, may be able to play a valuable auxiliary role in several projects already approved by the Fund. Consideration is now being given to procedures which would enable the Agency to inform the Fund in appropriate cases of the potential use of nuclear science in projects submitted to it and to make a scientific contribution to the execution of such projects.

PART ONE

EXTERNAL RELATIONS OF THE AGENCY

A. Relations with the United Nations

22. On 12 December 1960 the Director General presented to the General Assembly the annual report of the Agency covering the period 1 July 1959 to 30 September 1960 [1], which was then discussed in plenary meetings. Agency representatives also attended the resumed thirtieth session of ECOSOC and meetings of other organs of the United Nations. The United Nations for its part has continued to follow the work of the Agency closely.

23. Co-operation has continued on a number of matters of mutual interest; one such subject is the comparative economics of nuclear and conventional power; a second and very important one is the continued co-operation with regard to environmental contamination by radioactivity with UNSCEAR in the work of which the Agency participates actively. In the period under review the Agency has submitted papers to UNSCEAR on such subjects as radiation damage in bone, radioactive waste disposal, and the preliminary report on the joint dosimetry experiment which was held at Vinca, Yugoslavia in April 1960. A more detailed account of the Agency's activities in radiation protection is given in Part Two, Section I.C below.

24. The Agency has maintained its close relations with the regional economic commissions of the United Nations. It was represented at meetings of ECA, ECLA and ECAFE and at the ECE Inland Transport Committee Working Party on the Transport of Dangerous Goods and the ECAFE Fourth Regional Technical Conference on Water Resources Development. At the request of ECLA, the Director General has also submitted a general survey paper on nuclear power costs and their trends with special reference to less-developed countries, for consideration at the seminar on electric power which will be held in Mexico in August 1961. The Agency also co-sponsored with FAO and WHO the ECE Conference on Water Pollution Problems in Europe, held in Geneva in February/March 1961.

25. Various organs of the United Nations have made specific requests to the Agency. Pursuant to ECOSOC resolution 804 B (XXX) concerning the co-ordination of the results of the scientific research contained in the survey on main trends of inquiry in the natural sciences [6], to which the Agency contributed, the Agency's comments are being submitted to the Council in a separate report. In response to ECOSOC resolution 791 (XXX), the consolidated report of the Council's Committee on Program Appraisals [4] was submitted for consideration and comment to the Board in February 1961. (See Part Three below).

26. The suggestion contained in ECOSOC resolution 801 (XXX) that the agencies would find a "streamlining" review beneficial, has been noted. The program and budget of the Agency is prepared and submitted under the authority of the Board itself, unlike the procedure followed in most other organizations where this authority is vested in the Director-General or Secretary-General. The budget preparation procedures followed by the Board appear to serve much the same purpose as the annual review which has been undertaken by the Secretary-General of the United Nations, and it does not appear that a separate arrangement for a streamlining review is necessary, at least at this early stage in the Agency's work. The purpose of such a review is, however, appreciated and it is felt that a detailed examination of the work program can be a continuing process through the annual assessment of the extent to which the forecasts made in the Agency's appraisals report are being realized.

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[6] United Nations document E/3362 and Corr. 1.

B. Participation in EPTA and relations with the Special Fund

27. Although, for 1959, the Agency received - under special arrangements - a lump sum allocation from the funds of EPTA, 1960 was the first year in which the Agency's technical assistance program financed from these funds was prepared and developed fully in accordance with the normal programing procedure then in force. The Agency, together with the other participating organizations, took part in the new two-year programing procedure for 1961 and 1962 and is now engaged in implementing the program for the first of these two years. The requests for assistance received from Governments again show a substantial increase over the 1960 program.

28. The Agency was represented at the fourth and fifth sessions of the Governing Council of the Special Fund.

C. Participation in the work of ACC

29. The Director General attended the thirtieth and thirty-first sessions of ACC held in April and October 1960 respectively. The Agency was also represented at all meetings of the Preparatory Committee held in 1960.

30. Pursuant to ECOSOC resolution 799 B III (XXX), ACC entrusted the Agency with the preparation of the preliminary documentation to enable ACC to undertake the first multilateral review of activities of the United Nations family relating to atomic energy. The results of this review will be reported upon by ACC.

31. The Agency has also continued to participate in subsidiary bodies of ACC, such as CCAQ and CCPI.

D. Relations with the specialized agencies

32. In view of the growing number of questions of mutual interest to the Agency and IMCO relating to the nuclear propulsion of merchant ships, the prevention of radioactive contamination of the sea and the carriage of radioactive materials by sea, a relationship agreement has been under negotiation between the two organizations. The agreement was approved by the IMCO Council in January, and by the Agency's Board of Governors in February 1961; it will be submitted to the Assembly of IMCO in April and to the General Conference of the Agency early in October 1961.

33. The Agency and the specialized agencies with which relationship agreements had previously been concluded (ILO, FAO, UNESCO, WHO, ICAO and WMO) have continued to be represented at meetings of each other's governing bodies and conferences, as well as at scientific meetings and panels of experts. An increasing number of scientific meetings and training courses have been organized in collaboration with certain specialized agencies. These are described in more detail later in the report.

E. Relations with inter-governmental organizations outside the United Nations framework and with non-governmental organizations

34. Closer relations have been established between the Agency and a number of inter-governmental organizations outside the United Nations framework, concerned with various aspects of the peaceful uses of atomic energy. Agreements were concluded between the Agency and ENEA (of the Organisation for European Economic Co-operation) and with IANEC (of the Organization of American States). The agreement with ENEA came into force on 30 September 1960 and the agreement with IANEC on 21 December 1960.

35. Information is exchanged regularly between the Agency and several other inter-governmental organizations on such matters of mutual interest as the Agency's Regulations for the Safe Transport of Radioactive Materials and other health and safety matters.

36. Since the last report of the Agency to the Council, consultative status with the Agency has been granted to six more non-governmental organizations, bringing the total number to 18. A list of these is given in Annex A.

PART TWO

THE AGENCY'S SCIENTIFIC AND TECHNICAL WORK AND THE MAIN PROGRAMS FOR ITS EXECUTION

37. This part of the report is divided into two sections. The first of these describes the main scientific and technical work of the Agency relating to the development of nuclear power (including the procurement and supply of raw materials and reactor fuels), the application of radioisotopes and radiation and the protection against radiation effects. The second describes the main programs which the Agency undertakes in carrying out this work, namely the provision of technical assistance, the distribution of information and the promotion of research and development.

I. THE SCIENTIFIC AND TECHNICAL WORK

A. Nuclear power, reactors, fuels and materials

1. Economic and technical studies of nuclear power

38. The Council has been informed of the terms of General Conference resolutions GC(II)/RES/27 and GC(III)/RES/57 [7], on the subject of assistance to less-developed countries in connection with the development of nuclear power. At its fourth regular session, the General Conference adopted resolution GC(IV)/RES/86, in which it was recommended that nuclear power surveys should continue to be carried out in Member States, at their request, and that the Agency should pursue and develop general studies of nuclear power costs.

39. The Agency is accordingly engaged in the following activities:

(i) The collection and distribution of technical and cost information on power reactors;

(ii) The development of methods for the evaluation and use of this information; and

(iii) Studies of specific cases requested by Member States.

40. When collecting technical information, the Agency follows very closely the development of different power reactor systems and the problems which may arise from their operation in less-developed countries.

41. The Agency has prepared a survey of the latest data on power reactor costs and is completing a second, up-to-date, expanded version which is expected to be published in 1961. In addition, a general survey paper on nuclear power costs and their trends, with special reference to less-developed countries, was prepared at the request of ECLA, for submission to its Seminar on Electric Power which is to be held in August 1961 in Mexico.

42. It has been found that in trying to apply cost data on power reactors, certain Member States encounter difficulties in:

(i) Interpreting the significance of construction and fuel cost figures quoted by countries advanced in nuclear science;

(ii) Adjusting these figures to their own situation; and

(iii) Allocating these costs to determining energy production costs.

43. In order to alleviate these difficulties, the Agency is taking action to develop a coherent set of principles relating to the assumptions on which nuclear power costs should be calculated.

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[7] See last year's report, United Nations document E/3365, paragraphs 28 and 29.

44. The Agency has, for example, begun to prepare a manual on this subject which is being reviewed by a panel of experts, and will be published in 1961. This manual is designed to provide a checklist of the items which the construction and operation of a nuclear power reactor involves, and to suggest some uniform procedure for determining the generating costs of the electrical energy produced by a nuclear power station.

45. In addition to its work on power costs, the Agency has continued to provide assistance and advice to Member States, upon request, on specific nuclear power projects.

46. The type of assistance requested necessarily differs according to the degree of industrialization of the country concerned. In industrialized areas, the advice sought from the Agency is likely to be in connection with nuclear power projects which are being contemplated. The Government of Brazil, for example, requested the Agency to provide experts on third party liability and nuclear safety in connection with the 150-200 megawatt nuclear power station which is being planned in the Rio de Janeiro - São Paulo area (the Mambucaba project).

47. Where the installation of a first nuclear power plant is under consideration in countries which have already had considerable experience in conventional energy production and distribution, the Agency's assistance may take the form of an analysis of the conditions under which a first nuclear power plant could profitably be installed within an existing power network.

48. The Government of Finland, for example, invited the Agency to collaborate in studies to determine the extent to which nuclear power will be needed in the next decade. [8] The results of these studies have now been published in a report [9] which, after giving an estimate of the development of power demand and supply in Finland for the next ten years, sets out the conditions under which nuclear power could compete with conventional alternatives. It is concluded that by 1970 under certain conditions a 250 megawatt nuclear power plant might be operated economically with an 80 per cent load factor.

49. In less-industrialized areas the role of the Agency is likely to be wider, involving critical analyses of the national energy and electric-power forecasts. Thus, at the request of the Philippine Government, the Agency despatched to the Philippines in October 1960 a team composed of two nuclear power specialists and of a United Nations natural-resources economist, to investigate the prospects for nuclear power in the Manila area in the next decade, in relation to the country's economic development and its fuel and power situation as a whole.

50. The nuclear power studies referred to above may also serve as a guide to other Member States contemplating the installation of nuclear power, in that they illustrate the problems which may be encountered at different stages of industrialization.

51. As a result of the offer made by the Government of the United States of America [10], the Agency is following closely the technical work being undertaken by the United States Atomic Energy Commission in designing and constructing small power reactors and bringing them into operation. Members of the Agency's technical staff visited the United States in June 1960 and January/February 1961 in this connection. The Agency's participation in this work will be of great assistance in its studies of the technical and economic aspects of smaller power reactors, particularly with regard to their application in less-developed countries.

2. Reactor research and development

52. The Agency is co-operating with the Norwegian Government in a scientific research program on reactor physics using the zero power reactor facility NORA. The program

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[8] United Nations document E/3365, paragraph 37.

[9] Prospects of Nuclear Power in Finland, Technical Report Series No. 2. STI/DOC/10/2.

[10] United Nations document E/3365, paragraph 32.

began in March 1961 and is expected to last approximately three years. The fundamental reactor physics data on heavy water, light water and mixed lattices will be measured with high precision. This work will serve to check the accuracy of theoretical reactor calculations and will help the designers of power reactors in choosing the best data for particular reactor systems.

53. As part of the reactor physics program a seminar was held in Vienna from 25 to 29 April 1960, on Codes for Reactor Computations, at which methods of machine calculation for the design of reactors were discussed. A seminar on the Physics of Fast and Intermediate Reactors is planned for August 1961.

54. A conference was held in Vienna from 5 to 9 September 1960 on Small and Medium Power Reactors, at which the technical and economic aspects of such reactors and their suitability for use in less-developed countries were considered. The United Nations and IBRD participated, the United Nations contributing a paper on characteristic features of the power situation in less-developed countries.

55. The conference showed that intensive work is being done to develop small and medium power reactors and make them competitive with the conventional alternatives for the less-developed countries.

56. A symposium on Inelastic Scattering of Neutrons in Solids and Liquids was organized by the Agency and held in Vienna from 11 to 14 October 1960. This symposium dealt with the influence of the thermal vibrations of atoms in solids, liquids and molecules on the process of the slowing down and thermalization of neutrons in moderators, which is of great importance to the advance of scientific knowledge on this subject. Papers were presented on various aspects of the general theory, methods and results of neutron spectrometry; neutron scattering in solids and liquids and by molecules; neutron scattering by cold moderators; and cooling of neutrons.

57. At the symposium on Pile Neutron Research in Physics, convened by the Agency in Vienna from 17 to 21 October 1960, an opportunity was provided for physicists from newly completed reactor centers encountering the problems inherent in the planning and implementation of the initial stages of a nuclear research program, to exchange information with physicists from centers that have already accumulated considerable experience in the use of research reactors. The research uses of pile neutrons in nuclear physics, and in solid and liquid state physics were discussed and a special session was devoted to consideration of pile neutron research in the less-developed countries.

3. The supply of nuclear fuels (fissionable and source materials) and equipment

58. Nuclear fuels have not yet been supplied in substantial quantities under the auspices of the Agency. This is largely explained by the slow development of nuclear power. In the case of countries where nuclear power has been developed, fuel has, moreover, usually been obtained either under long-standing bilateral arrangements or by domestic production.

59. Materials which can be supplied through the Agency include natural and enriched uranium, thorium and its compounds, and monazite. Natural and enriched uranium is available for supply to Agency projects under supply agreements with the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland and the United States of America. Substantial quantities of uranium chemical concentrates such as UO_2, UO_3, U_3O_8 (uranium oxides) and UF_4 (uranium fluoride) have been made available for supply to Agency projects by Belgium, Canada, Portugal, Spain, the Union of South Africa and the United States. India has made thorium and its compounds available, and Ceylon has offered supplies of monazite. The Agency is thus able to draw upon plentiful supplies of nuclear materials from these Member States. Although the prices at which these materials would be supplied by the offering countries are not yet known in all cases, it would appear that the lowest domestic or international market prices generally apply.

60. A symposium on Fuel Element Fabrication, with Special Emphasis on Cladding Materials, was held in Vienna in May 1960. Among the main topics discussed were the characteristics of cladding materials, quality control and inspection, corrosion and

radiation damage, economics and general trends in the development of fuel element fabrication.

61. Arrangements have been concluded between the Agency, the Government of the United States and the Government of Finland, which provide for the transfer of enriched uranium for the Triga Mark II research reactor which was supplied by the United States to Finland through the mediation of the Agency. In this case the Agency was able to make use of a materials grant of $50 000 from the United States in providing Finland with enriched material free of charge.

62. The Board has also approved in principle the supply of three kilograms of enriched uranium from the Soviet Union for a critical assembly for Finland. When the final design of the assembly has been completed, and the required data has been submitted, a supply agreement will be negotiated with the Soviet Union and the final project submitted for approval by the Board.

63. Under an agreement concluded between the Agency, Norway and the United States, a fuel charge of uranium enriched to 3 per cent in U^{235}, which was used when the reactor for the nuclear ship "Savannah" was designed, will be leased to Norway for the zero power reactor NORA operated by the Norwegian Institute for Atomic Energy in connection with the joint program of scientific research referred to in paragraph 52 above. As two fuel charges are being provided by Norway, one of natural uranium and the second of uranium enriched to 1.7 per cent in U^{235}, studies with three cores of fuel enriched to different degrees will be possible.

64. In assisting Member States to develop atomic energy for peaceful purposes, the Agency has provided quantities of equipment. In addition, technical advice and information has been supplied on fissionable, special reactor and nuclear raw materials and the availability and suitability of the necessary equipment and instruments.

B. Radioisotopes and radiation

65. Experience has already shown that one of the more immediate ways in which the use of nuclear energy can assist the less-developed countries in their economic and social development is the application of radioisotopes and radiation to medicine, agriculture and industry. The provision of advice and help in this field will therefore continue to be an important part of the Agency's technical assistance activities, which are described in section II below. An account is given below, of meetings and training courses which are being organized by the Agency to promote a wider understanding of the various uses of radioisotopes, and of the research and studies being undertaken to improve existing knowledge of the subject.

1. Medicine

66. The most important use of radioisotopes and radiation sources appears at present to be their medical applications, including radiation therapy, diagnosis and clinical research, and it is customary for less-developed countries to consider these as the first practical use to be made of atomic energy. It may be noted that the funds initially required for work in the medical applications are relatively small; to carry out most of the routine diagnostic radioisotope tests, for example, equipment costing about $6 000 is required.

67. Research contracts on the medical uses of isotopes were renewed with institutes in Greece, Iraq, Israel and the Philippines, and new research contracts were granted to institutes in Thailand and the Union of South Africa. All these contracts are concerned with diseases which affect a large proportion of the population of tropical or sub-tropical climates, such as those caused by malnutrition and infection from parasites. Research has continued on the development of methods for cheaper production of such isotopes as calcium-47.

68. A symposium on the Use of Radioisotopes in the Study of Endemic and Tropical Diseases was jointly held by the Agency and WHO in Bangkok from 12 to 16 December 1960. At the symposium nutritional deficiencies, anaemias, endemic goiter, water and electrolyte metabolism, medical entomology and parasitology were discussed.

69. Work has continued on subjects previously reported to the Council. The report of a study group convened by the Agency and WHO on the use of radioisotopes and supervoltage radiation in radiotherapy was published and work has continued on the dosimetry aspects of this subject. A panel was convened by the Agency in November 1960 to review the data and existing information which had been obtained from various major radiotherapy centers.

70. Reference has already been made to some technical co-operation projects in the medical field. In addition, the Agency provided one visiting professor and five fellowships on request from certain Member States for the training course which was held in Leopoldville from 16 May - 19 June 1960 on the applications of radioisotopes with emphasis on their medical uses (see paragraph 145 below). The course was organized by CCTA and co-sponsored by WHO.

71. The courses given by the Agency's two mobile radioisotope laboratories, referred to in paragraph 149 below, were also of interest in respect to the medical uses of radioisotopes.

72. In addition, members of the scientific staff have given assistance to various Member States in the installation and calibration of teletherapy units.

73. The Agency is undertaking a new project whereby it will send experts, upon request, to advise Member States on measurements using radioactive iodine in diagnosis of thyroid diseases with a view to making an international comparison of this data.

2. Agriculture

74. The Agency's work in connection with the use of radioisotopes in agriculture and agricultural research has been concentrated for the greater part on the problems of less-developed areas.

75. In the course of the period under review, the work under four research contracts in agriculture was completed. This work covered the genetic effects of radiation on crops, such as sugar cane and rice, the absorption of radioactive wastes by rice, and nutrient absorption through plant leaves. Work is also being carried out under certain other agricultural research contracts. In work with fertilizers radioisotopes are being used to study the action of raw rock phosphate in soils, to find methods of avoiding phosphorus fixation in acid red soils, to evaluate different fertilizer materials in rice soils, and to assess the value of foliar application of fertilizers. Fundamental data which will serve as a basis for the better understanding both of fertilizer action and the extent of absorption of radioactive nuclides from the soil by plants, will be obtained from two studies of the interaction of plant nutrient ions with soils and clays, and a further study of the mechanics of the transfer of strontium-90 from the soil into the plant. Seven studies relating to plant genetics are being made on the effect of ionizing radiations in inducing variations in a number of crop plants, especially rice. These investigations range from microscopic studies of the mutations induced in plant cells by radiation, to the development of methods of selection of the new varieties created.

76. At the symposium on the Effects of Ionizing Radiation on Seeds and Their Significance for Crop Improvement, which was held in August 1960 at Karlsruhe, Federal Republic of Germany, and in which FAO co-operated, the effects of various radiations on seeds, as well as the application of radiation effects for the improvement of crops, were considered in relation to the environmental factors involved. Papers were presented on a number of topics including the isolation of improved marketable varieties of wheat, barley, rice and peas, making use of irradiation methods of inducing hereditary changes in conjunction with standard procedures of selective breeding. The active participation of scientists from less-developed areas indicated the importance of the use of nuclear energy for the improvement of crops and for greater yields in food production in the campaign against hunger.

77. At the symposium on Radioisotopes and Radiation in Entomology, organized by the Agency in Bombay in December 1960, the use of radioisotopes and radiation in the control of insect pests was discussed. This is a rapidly expanding subject which is receiving increasing attention and it is of particular importance that opportunities be provided for the exchange of information on the use of radiation techniques to control insect damage to the typical agricultural products of less-developed areas. The symposium was the first scientific meeting organized by the Agency in Asia.

78. Technical assistance in the agricultural uses of radioisotopes has been provided during the year to Burma, Thailand, Tunisia, Turkey, the United Arab Republic and Yugoslavia. Preliminary surveys of possible agricultural applications were also made in several other Member States. Close co-operation is being maintained with FAO.

79. In co-operation with an OEEC/ENEA study group, the Agency is doing work on behalf of Member States on a detailed evaluation of specific applications of food irradiation. Joint regional food irradiation programs are being worked out and proposals are being considered to set up a permanent panel to consider questions relating to the health and safety aspects of irradiated food. On request, the Agency's staff is contributing regularly to the Quarterly International News Letter "Food Irradiation", which is sponsored by OEEC/EPA and published by the European Information Center for Food Irradiation, Saclay, France.

80. An international training course on radioisotope techniques in soil-plant aspects of agricultural and forestry research, as mentioned in paragraph 146 below, will be held jointly with FAO and in co-operation with the Netherlands Government, in Wageningen, Netherlands, from 4 April - 26 May 1961. Students are expected from about 20 countries. The main purpose of the course will be to show how radioisotopes can be used in research and to give technical information and guidance on advanced radioisotope methods.

3. Industry and the physical sciences

81. Several countries have published information on the industrial savings achieved from the use of radioisotopes. The Agency is now making a critical survey of this subject comparing the results reported by various Member States with a view to making recommendations to indicate where further savings may be made.

82. Much information is available about the applications of isotopes in science and industry. Most of this data has however been published in a somewhat scattered and haphazard way as new results have been reported, and they have appeared in scientific periodicals rather than in those devoted to particular industries. It is believed that as a result, even in the advanced countries, industry is not yet sufficiently aware of potential applications. The Agency is therefore making a systematic survey of radioisotope applications of interest to various industries. The survey will contain useful reference material and short general descriptions of radioisotope techniques. The survey will classify examples of how radioisotopes have been used in solving problems according to the industry concerned.

83. The Agency is also making an economic study of the production, imports and distribution of radioisotopes in Member States. Among the questions being studied is whether it is more economical to import radioisotopes from the major producing countries or to manufacture them domestically if small research reactors are locally available. The subject is of particular interest to a number of Member States now installing such reactors. The study will also cover the economics and manpower requirements for starting domestic production.

84. The major Agency scientific meeting in 1960 was a conference on the Use of Radioisotopes in the Physical Sciences and Industry. It was held in Copenhagen from 6 - 17 September and was organized with the co-operation of UNESCO. Papers were presented to the meeting on the manifold applications of radioisotopes in the various branches of the natural sciences such as nuclear physics, chemistry and metallurgy, as well as with their use in industrial processes.

85. From the proceedings of the conference it was clear that radioisotope applications are not only growing in variety but rapidly passing from the stage of officially sponsored research and experiments to that of standard industrial practice. Many of the delegates came from technical and industrial groups and a large number of the papers dealt with or bore upon industrial applications. Among the industrial uses about which information was given at the conference were methods for prospecting for ore and coal deposits, various applications in oil refineries, the latest developments in thickness gauging, the growing importance of the use of tracers in the measurement of machine and engine wear, leak detection, measurements of gas and liquid flow, metallurgical research and in particular use of radioisotope techniques in the production and analysis of the semi-conducting metals used in transistors.

86. Among the more novel applications described were the dating of ancient coins and medieval monuments and various meteorological uses of radioisotopes.

87. At the symposium on the Chemical Effects of Nuclear Transformations, held in Prague from 24 - 27 October 1960, papers were presented on the chemical effects of transformations of nuclei in gaseous, liquid and solid systems. Many of these covered the research which is being done on the tempering of radiation damage by heat, X-rays or gamma radiation. Others showed the results of original investigations on "hot" atom reactions, as well as some hypotheses based on these investigations. It is considered that this meeting, at which nearly all laboratories interested in "hot" atom chemistry were represented, will stimulate further research.

4. Hydrology

88. During the period under review the Agency also began a world wide survey to determine the concentration of hydrogen and oxygen isotopes in natural water. Monthly sampling of rainfall from various parts of the world has been started in collaboration with WMO. A number of national laboratories are co-operating with the Agency in the measurements of

these samples. The information obtained from the survey is expected to provide essential knowledge of background radioactivity which will be later needed for detailed hydrological experiments in a particular area. Such experiments and surveys may be of particular importance in arid zones in the less-developed areas; for instance for determining the storage time of ground water and its movement under the earth, and for dealing with river control problems which arise in new or existing irrigation works, such as the measurement of the movement of river beds. As was indicated in last year's report, the Agency has already studied some of these hydrological problems. It is now engaged in hydrological studies in Greece, in connection with the Special Fund Irrigation Project which FAO is carrying out in that country.

5. Radiation standards

89. For all operations in which substantial amounts of radiation are used, such as medical radiology, industrial radiography, thickness gauging, etc., it is essential to have accurate standards of reference against which the radiation emitted by the source in use can be checked. Work has therefore continued during the period under review to enable the Agency to provide such standards. This work has been done in the small laboratory set up in the Agency's present headquarters building, pending the move to the laboratory now being built at Seibersdorf near Vienna, which will be occupied late in 1961.

90. The program has consisted of:

(i) Studies of methods of absolute measurement of radionuclides;

(ii) The participation in a number of inter-comparisons of radionuclides organized by ICRU and IBWM, for the purpose of calibrating reference sources; and

(iii) The distribution of calibrated solutions of phosphorus-32 and iodine-131 with a view to inter-comparing the measurement methods used. Seventeen national laboratories in the following countries participated in the inter-comparison of iodine-131: Austria, Canada, the Czechoslovak Socialist Republic, Denmark, France, the Federal Republic of Germany, Italy, the Netherlands, Poland, Sweden, the United Kingdom, the United States, and Yugoslavia.

91. Consultations are also proceeding with IBWM for co-operative arrangements in the field of metrology of radionuclides and radiation sources and the need for an inter-agency agreement is being studied.

C. Protection against radiation

92. The Agency has continued to work on a very wide range of subjects connected with protection against radiation, in order to fulfill its statutory functions of establishing or adopting standards of safety for protection of health and the minimization of danger to life and property. In setting up these standards it is necessary to fill, by the promotion of research, the wide gaps in knowledge about the effects of radiation to which the reports of UNSCEAR have drawn attention. The Agency has concentrated in research on various subjects related to radiobiology, problems connected with the pollution of the sea by radioactive waste, and radiation dosimetry. Attention has also been given to problems of the pollution of fresh water, to the safety aspects of nuclear propulsion, and to questions of legal liability arising in the event of nuclear accidents. As the safety standards are formulated, they become in turn the basis for regulations, manuals and codes of practice which will eventually cover all aspects of nuclear technology, while taking account of its rapid evolution.

93. In planning research and in preparing regulations and manuals, the Agency continues to rely on panels of experts drawn from widely distributed geographical areas, for which the working papers are normally prepared by the Agency's Secretariat. Other interested organizations within and without the United Nations family are invited to participate on matters within their competence. In the case of regulations and other legal instruments, the work of the panels is eventually circulated to Governments and in appropriate instances submitted to the Board and the General Conference of the Agency.

1. Research on radiation effects

94. Research under this heading has continued to account for a substantial proportion of the Agency's research contracts. The Agency has continued to co-operate with UNSCEAR, ICRP and ICRU, and to pay special attention to the support of research on fundamental radiobiology, pursuant to the request of the General Assembly in its resolution 1376 (XIV).

95. In March 1960 some 20 radiobiologists and research workers attended a panel to advise on the co-ordination of 19 research contracts which the Agency planned to award in radiobiology. Each proposed subject of research was discussed and at the same time different research methods were compared and subjected to critical evaluation. These subjects included fundamental problems of natural radiation resistance, the mechanism of radiation damage at cellular and sub-cellular levels (including low-level exposure and its immediate effects), the effects of ionizing radiations on the nervous system and the modification of natural radio-resistance. The food irradiation program of the Agency was also discussed. It was mentioned that irradiation effects might well contribute to the solution of the problems in areas which are deficient in food. The recommendations made on the present and future research programs of the Agency in radiobiology conformed with the conclusions reached by UNSCEAR at its sixth session.

96. UNSCEAR had recommended "that the specialized agencies of the United Nations and other bodies give adequate support to fundamental biological research, stimulate this research by organizing frequent exchanges of new information, possibly by holding interdisciplinary symposia, and helping in the training of specialists by granting an appropriate number of fellowships in general biological disciplines". [11]

97. As part of the Agency's program to obtain more information on the toxicity of biologically important radionuclides, a study has been made on bone-seeking isotopes. A panel of experts, on which the United Nations, FAO and WHO were represented, was convened in Vienna from 3 - 5 October 1960 to advise on the Agency's strontium-90 program. The panel recommended certain research on strontium-90 chronic toxicity. As a result the Agency, in consultation with UNSCEAR, is supporting research projects in which groups of persons occupationally contaminated with strontium-90 are being thoroughly investigated

[11] United Nations document A/4119, Annex I, paragraph 12.

in order to determine metabolic behavior of strontium-90 in humans. It is planned to extend the studies and to establish a central register of all accessible cases. This will make possible a correlation between the level of strontium-90 contamination and the biological effects.

98. A symposium on Initial Effects of Ionizing Radiations on Living Cells, which was organized by the Academy of Sciences of the Soviet Union and co-sponsored by the Agency and UNESCO, was held in Moscow in October 1960. The papers presented concerned the current trends in fundamental research in radiobiology, with particular emphasis on the initial steps in the chain of reactions at the cellular and sub-cellular level, produced by exposure to ionizing radiations.

99. In June 1960, the Agency convened a symposium on Selected Topics in Radiation Dosimetry, which was held in Vienna. WHO, CERN, ENEA and EURATOM were also represented. This was the first international meeting to deal specifically with the problems of radiation dosimetry. In addition to providing a comprehensive survey of the present status of routine dosimetric procedures and radiation dosimetry research, some useful suggestions were given as a guide for the Agency's own work in this field. In this regard, a program for the absolute measurement of absorbed doses from external radiation beams and for the establishment of neutron source standards for international comparison has been undertaken. This work will provide means for the callibration and standardization of radiation-measuring instruments.

2. The effects of radioactivity in the sea

100. The problem connected with the effects of radioactivity in the sea are of concern to all organizations interested in oceanographic research and the marine sciences. The Agency is a member of the ACC sub-committee on oceanography and is working in co-operation with the other members and with interested organizations outside the United Nations family such as SCOR. The Agency's panel of experts on radioactive waste had emphasized that the Agency should continue to study the prevention of radioactive pollution of the sea, a view which was also held by the Inter-Governmental Conference on Oceanographic Research which was held in Copenhagen, 11 - 16 July 1960, under the auspices of UNESCO.

101. An agreement has been made with the Government of Monaco and the Institute of Oceanography in Monaco for a three-year joint research program on the effects of radioactivity in the sea.

102. A number of contracts to promote oceanographic research were awarded in 1960, an amount of over $50 000 being allocated for this purpose alone.

3. Conferences dealing with radiation protection

103. In view of its concern with problems of water pollution, the Agency, together with FAO and WHO, co-sponsored the conference on Water Pollution Problems in Europe, which was convened by ECE in Geneva in February 1961. The most urgent legal, administrative, technical and health aspects of the subject were discussed and consideration was given to possible forms of international action in this field.

104. Attention has been given to emerging questions of safety arising from the advent of nuclear propelled ships (see also paragraph 121 below), and a symposium was held in co-operation with IMCO at Taormina, Italy, from 14 - 18 November 1960 on Nuclear Ship Propulsion, with Special Reference to Nuclear Safety. The economic, technological and operational aspects of ship reactors were discussed. Papers were presented dealing with the safety of different types of reactors, reactor control and instrumentation, the testing of reactor components, and problems arising from the entry into harbors of nuclear propelled ships.

4. Radiation protection services

105. The Agency has continued to provide technical advice and services to Member States in less-developed areas on the application of health and safety regulations and the setting-up of safety services. Visits have been made by members of the technical staff to a group of Member States in the Far East and an instructional guide on the organization of film monitoring services has been prepared. A considerable proportion of the Agency's technical assistance activities, including fellowships, has been devoted to problems of radiation protection, particularly in the new nuclear installations in less-developed areas.

106. Part of the work of the Agency's laboratory has been referred to in paragraph 89 above. Its second main activity has been the measurement of the radioactive contamination of the environment (vegetation, soils, water) and of foods, essential for the protection of health.

107. Approximately 300 food samples, originating from various countries (Austria, the Federal Republic of Germany, Indonesia, Pakistan, the Philippines, Poland, Switzerland, Turkey and the United States) have been analyzed. Eighty per cent of these have been milk samples and 20 per cent other foods, such as vegetables, fruit, cereals, potatoes and meat. The samples have been analyzed in order to ascertain total beta activity and strontium-90 and caesium-137 contamination. Furthermore, air samples have been analyzed for their total beta activity, as well as water samples for contamination of strontium-89, strontium-90, caesium-137, barium-140 and cerium-144.

108. At the request of the Turkish Government, the Agency's laboratory has carried out analyses of some 50 samples of soil and vegetation, originating from the site of the Istanbul reactor.

109. Within the program mentioned above and at the request of the Austrian authorities the laboratory is carrying out a continuing survey of the radioactive contamination of the most important foodstuffs in Austria (milk, vegetables, fruit, etc.). A preliminary report on the results of this survey has recently been submitted to the Austrian Government and a copy sent to UNSCEAR.

110. Finally, the Agency's laboratory has given in-service training to seven fellows from various Member States (Austria, Indonesia, the Philippines, Poland and the United Arab Republic) in the methods of analysis of environmental radioactive contamination.

111. The Agency has also undertaken a number of special projects for the evaluation of the safety of new reactor sites at the request of Member States. Thus the hazards of the high flux reactor being constructed at Petten in the Netherlands have been evaluated by a team of experts. Following the evaluation of the Swiss Diorit reactor, referred to in last year's report,[12] a preliminary reactor safety report has been prepared concerning the Swiss Enusa reactor. In addition, experts from the Agency's staff assisted the Yugoslav Government in selecting a site for a research reactor.

5. Emergency assistance

112. The Agency is also considering what part it can play in arrangements to enable help to be given in the event of a nuclear accident in the territory of a Member State. While the leading nuclear countries may be able to deal with such incidents from their own resources, an accident might cause problems of extreme urgency in a country in the less-developed areas, which cannot economically maintain all the necessary services for dealing with such an eventuality. Such problems may be especially grave in countries remote from large existing nuclear installations. The role of the Agency in this system would be mainly that of an intermediary. It could act as a clearing house for information on the facilities and expert knowledge which might be made available by participating Member States. It is

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[12] United Nations document E/3365, paragraph 4(e).

envisaged, however, that in certain circumstances the Agency might participate in the organization of the assistance or might itself supply certain categories of assistance. It is preparing standard terms and conditions which might be used as a basis for bilateral agreements if a State on whose territory an accident occurred requested help from another participating Member State. In this connection the General Conference has authorized the Director General (in resolution GC(IV)/RES/73) to advance from the Agency's Working Capital Fund a sum of up to $50 000 in each case, to meet the Agency's costs in organizing and giving such emergency help.

6. Regulatory and legal work

(a) Basic safety measures and standards

113. In March 1960 the Board of Governors approved the principles on which the Agency's health and safety standards could appropriately be based and proposed measures to ensure the observance of such standards in conjunction with assistance furnished by or through the Agency.

114. The establishment of basic safety standards for application to Agency operations and assisted operations was studied by a panel of experts which met in November 1960, after which draft provisional standards were circulated for comment to Member States. These comments will be considered by the panel when it meets again in June 1961. This method of preparation is designed to ensure that the basic safety standards will not be inconsistent with existing national and regional standards and may also provide guidance to those Member States who have not yet drawn up national health and safety regulations connected with the peaceful uses of atomic energy.

(b) Transport regulations

115. The work of the two panels set up in response to Council resolution 724 C (XXVIII), to formulate regulations for the safe transport of radioactive materials was completed in 1960. The draft regulations were approved by the Board of Governors in September 1960, and in approving them the Board authorized the Director General to apply them to the Agency's operations or assisted operations, and to recommend to Member States and organizations concerned, that they be taken as a basis in relevant national regulations and be applied to international transport.[13] The Director General was also authorized to propose to the United Nations that the regulations be included as recommendations of the United Nations Committee of Experts for Further Work on the Transport of Dangerous Goods. The General Conference unanimously welcomed the establishment of the regulations.

(c) Control of waste disposal

116. The work of the panel on Radioactive Waste Disposal Into the Sea, which had been undertaken as a result of a request made to the Agency by the United Nations Conference on the Law of the Sea in 1958, was completed in 1959 and the report on the conclusions reached was distributed to Member States in April 1960.

117. In January 1961 a panel of legal experts began to consider the organizational, administrative and legal measures which might be taken at the international level to implement these conclusions. FAO, UNESCO, IMCO and ENEA participated in the work of the panel.

118. Furthermore, a panel will be convened in April 1961 to study the sampling and monitoring methods of waste disposal into the sea. It will also consider the necessary standardization of sampling and analysis of radionuclides in sea water and marine products, recommended by the panel referred to in paragraph 116 above.

119. A panel of experts is studying problems associated with the disposal of radioactive waste into fresh water. Another panel is preparing a manual on safe disposal of low level waste from laboratories. It is expected that the work of these panels will continue into 1962.

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[13] For the Agency's own operations and those assisted by it, the regulations have full mandatory force; in other cases they serve as recommendations.

(d) Critical assemblies and research reactors

120. A manual of safe operation of critical assemblies and research reactors has been produced to meet an urgent need for guidance on safety practices when operating these facilities. It was prepared, after careful consideration of existing national safety practices, with the assistance of a panel of experts and in consultation with other international bodies concerned. It will be published during the course of 1961.

(e) Safety of nuclear ships

121. The Agency participated in the International Conference on Safety of Life at Sea which was convened by IMCO in May 1960, to revise the Convention of 1948 on Safety of Life at Sea. An expert from the Agency's staff actively participated in the work of the Committee on Nuclear Ships.

(f) Civil liability

122. As previously reported[14] a Draft International Convention on Minimum International Standards Regarding Civil Liability for Nuclear Damage was prepared by a panel of experts convened by the Director General in 1959. The draft convention, together with the panel's comments on each article, was circulated to Member States in April 1960 with a request for their views and suggestions on how best to give effect to the results of the Agency's work on civil liability. A number of Governments have already submitted comments and a committee of Government representatives will convene in 1961 to prepare a revised draft convention on the subject in the light of these comments.

123. The Belgian Government is convening a Diplomatic Conference on Maritime Law to be held in Brussels in April 1961, and the Agency is acting as co-sponsor in so far as it concerns the liability of operators of nuclear ships. A panel of legal experts was called by the Agency and met in March and August 1960 to consider this problem and the panel's recommendations, which were published in November 1960, will serve as a working document of the conference. The Agency has also elaborated for submission to the conference a draft convention on this subject based on the panel's recommendations.

[14] See United Nations document E/3365, paragraph 71.

II. MAIN PROGRAMS

A. Technical assistance

124. In the second year of its operational program, the Agency's technical assistance activities have continued to benefit from consultations with the United Nations and the specialized agencies from participation in EPTA and from services rendered by TAB representatives in the field. Not only the Agency's program financed under EPTA, but also its regular program and its preliminary assistance missions were considerably assisted by early consultations and the co-operation and advice received.

125. The co-ordination thus achieved has been noted by ACC in its twenty-fourth report to ECOSOC [15] where it is stated that "as far as assistance under EPTA is concerned, well established procedures for co-ordination already exist in respect of all projects including those involving the peaceful uses of atomic energy". As regards the Agency's regular program, the General Conference, at its fourth regular session, took note of a set of guiding principles and general operating rules to govern the provision of technical assistance by the Agency [16]. These are in harmony with the practices of the United Nations, EPTA and the specialized agencies.

126. The resources at the disposal of the Agency for carrying out its technical assistance programs are of three kinds, namely:

(i) Voluntary financial contributions to the Agency's General Fund;

(ii) Donations in kind, including the services of experts, fellowships and scholarships at national institutions of Member States, and equipment; and

(iii) Funds made available to the Agency, as a result of its participation in EPTA.

127. By 31 March 1961, the amounts that had been pledged and paid to the Agency's General Fund for 1960 and 1961 were as follows:

Year	Target set	Amount pledged	Amount paid
	$	$	$
1960	1 500 000	996 103	975 368
1961	1 800 000	1 177 742	101 000

Detailed statements of pledges and payments for 1960 and 1961 are given in Annexes B and C respectively.

128. The donations in kind in the form of fellowships, scholarships and offers of the services of experts in 1960 and 1961 cover many aspects of the peaceful uses of atomic energy. Lists of fellowships to be financed by Member States and offered to the Agency for 1960 and 1961 are given in Annex E and the offers of experts are listed in Annex F. In addition to these contributions and those, reported elsewhere, to the Agency's General Fund, full use was made of the offer by the United States, referred to in last year's report [17], of equipment for technical assistance projects up to a value of $200 000, and a gift for the laboratory of a scintillation counter for alpha particles was made by Belgium.

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[15] United Nations document E/3368, Annex I, paragraph 6.

[16] General Conference resolution GC(IV)/RES/65.

[17] United Nations document E/3365, paragraph 99.

129. In 1960 the amounts spent by the Agency for technical assistance financed from EPTA funds were:

For experts	$ 203 010
For fellowships	$ 305 899
For equipment	$ 83 462
Total	$ 592 371

130. Under the EPTA allocation for 1961-62 which amounts to $1 483 500, of which $110 150 are set aside to meet requests for projects of a regional character, 38 countries will receive assistance from the Agency (14 more than in 1960) of which three are newly independent countries in Africa. In addition Agency programs amounting to $89 900 are provided under the supplementary program for Africa in accordance with ECOSOC resolution 768 (XXX).

131. In addition to the customary forms of technical assistance given by the United Nations family (services of experts, fellowships, exchange and training and limited quantities of equipment), members of the Agency's staff have provided technical advice, either in consultations at headquarters or by short missions to Member States.

132. The subjects on which the Agency generally gives advice or technical assistance were described in the report to the Council for 1959-60 [18].

133. The following paragraphs give a brief survey of the assistance given in the period under review.

1. Preliminary surveys

134. When the Agency began its operations in 1958, many of its Member States were at an early stage in the development of their programs for the peaceful uses of atomic energy and in some instances planning had not yet begun. Since the provision of technical assistance on a large scale often requires a considerable amount of preliminary work both by the requesting State and by the Agency, two of the Agency's early and continuing activities have been to dispatch preliminary assistance missions and to make preliminary surveys.

135. The missions and surveys undertaken in 1958 and 1959 were described in the reports to the Council for 1958-59 and 1959-60 [19]. In 1960 a preliminary assistance mission visited Greece, the Ivory Coast, the then Federation of Mali, Morocco, Sudan and Tunisia. Another mission of this kind went to El Salvador, Guatemala, Mexico, Paraguay and Peru. They studied the needs of the countries concerned with regard to the organization of atomic energy activities; education and training; reactor programs; radiochemistry; applications of radioisotopes in agriculture and medicine; health physics; power and energy; and prospecting, mining and processing of nuclear raw materials. In addition, smaller missions, composed of two or three members, have been sent to Member States in connection with specific technical assistance requests. It is planned to send in 1961 two missions to visit about ten countries in Africa and Latin America.

2. The provision of experts and equipment

136. Requests to the Agency for technical assistance under this heading come from countries at all stages of development but the greater number are from the less-developed countries. The requests have continued to become more numerous and more varied and in fact now considerably exceed the Agency's means to meet them. The Board has recognized that specialized equipment is of particular importance in carrying out nuclear energy projects. Technical assistance requests to the Agency, especially from less-developed countries embarking on atomic energy programs which are confronted with substantial

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[18] Ibid., paragraph 81.

[19] United Nations document E/3248, paragraph 67 and E/3365, paragraphs 83 and 84.

investments in foreign currencies, are often accompanied by requests for such equipment. Accordingly, the Board has decided that the general practice for the provision of equipment and supplies under EPTA should be followed in a flexible manner with regard to projects under the Agency's program.

3. Training and exchange

137. The lack of scientific and technical personnel possessing the necessary qualifications is one of the main reasons why in many parts of the world progress is slow in the peaceful uses of atomic energy. For this reason one of the important forms of assistance given by the Agency to Member States is in training students and in the exchange of scientists and experts. The growth of this program has emphasized the requirements of Member States and illustrated the Agency's capacity to meet them.

(a) Fellowships

138. As indicated in last year's report [20], Agency fellowships cover three kinds of training: general techniques training, specialist training and research training.

139. The growth of the fellowship program since its inception in 1958 can be seen from the table below.

Program Year	Nominations received	Number selected for awards	Fellows who have completed training	Fellows still studying
1958	287	219	116	42
1959	577	380	84	183
1960	648	468	3	81
Total	1 512	1 067[a/]	203	306

a/ This figure does not take account of subsequent cancellations or withdrawals. The number of fellowships taken up in 1960 was 429 and the total for the triennium was 983.

140. Of the 1 067 candidates selected for awards, 180 were awarded fellowships under EPTA. A detailed description of the status of the 1960 fellowship nominations, awards and placements, whether financed directly by Agency funds, EPTA funds or by Member States, may be found in Annex D; while Annex E lists the Member States offering fellowships for 1960.

[20] United Nations document E/3365, paragraph 88.

141. The distribution of fellowships in the years 1958, 1959, and 1960 between various subjects of study is shown in the table that follows:

Subject of study	Nominations received	Fellowships completed and fellows studying
Application of radioisotopes and radiation	468	138
Chemistry[a/]	165	73
Geology[b/]	68	14
Health physics	140	51
Nuclear chemical engineering	67	11
Physics[c/]	264	96
Reactor engineering	329	116
Miscellaneous	11	10
Totals	1 512	509

a/ For example, analytical, "hot" and radiochemistry.

b/ For example, of nuclear raw materials.

c/ For example, nuclear, neutron and theoretical.

142. By 31 March 1961 526 nominations had been received under the 1961 program.

(b) Exchange of scientists

143. At the request of Member States, the Agency arranges for visiting professors or scientists to go to their countries to lecture, organize courses, improve the curriculum of educational establishments or initiate research projects. This enables the Agency to lend effective assistance to less-developed countries in the training of nuclear scientists and also provides an opportunity for the selection and preparation of suitable students as candidates for further training under the fellowship program.

144. In 1959, eight visiting professors or scientists were sent by the Agency to various countries. Under the 1960 program arrangements were made to send out 17, including one scientist whose contract was extended.

(c) Training courses

145. As previously reported to the Council [21], an international course in the use of radioisotopes in agricultural research was held in New Delhi from 20 January to 17 February 1960, which was sponsored jointly by the Agency, UNESCO and the Indian Government. At the request of Member States, the Agency also assisted in an international course on the application of radioisotopes organized by CCTA and co-sponsored by WHO, which was held in Leopoldville, Congo, from 16 May to 19 June 1960.

146. The following courses are planned for 1961: a regional training course in radioisotope techniques to be held in Cairo, United Arab Republic, (March-May); a regional training course on the application of radioisotopes in medicine to be held in Cairo, United Arab Republic, (October-November); an international training course on radioisotope techniques in soil-plant aspects of agricultural and forestry research, to be held in co-sponsorship with FAO in Wageningen, Netherlands (4 April-26 May); and an international training

[21] Ibid., paragraph 92.

course on radiobiology in health physics, to be held at the Israeli national radioisotope training center situated at the site of the research reactor near Rehovoth (October-November). At the request of the Japanese Government, an international training course on radiological protection, to be co-sponsored by the Agency and WHO, will also be held in Japan later in the year. It is also planned to hold an international training course on the medical applications of radioisotopes in Athens, Greece, at the beginning of 1962.

147. The established practice for such training courses is that the host Government makes available its laboratory facilities and teaching staff, while the Agency assists in the preparation of the courses and provides visiting professors and scientists. When the topic is of interest to other organizations within the United Nations system, joint sponsorship is arranged where possible.

148. The Agency has also been approached by Member States to assist them in setting up regional training centers. For example, in March/April 1960 a mission visited certain countries in Africa and the Middle East to study the problem of establishing one or more regional training centers for this area. The Board subsequently decided to endorse a request from the United Arab Republic for the establishment in Cairo of a Middle East regional radioisotope training center for the Arab countries, subject to the prior holding of a series of training courses in Cairo and the submission by the Director General of a report to the Board on a draft project agreement in the light of the results of these courses (see paragraph 146 above). As a result of the receipt of similar requests from Greece and Turkey the Board decided that it would consider the desirability of establishing centers in these countries also, after experience had been gained through the holding of training courses.

149. The Agency's two mobile radioisotope laboratories are used for training in general radioisotope techniques, especially in their agricultural, medical and chemical applications. In 1960 one mobile laboratory was used in Latin America. Eight courses were held in various cities in Mexico between January and April with 141 students participating, and in Argentina 35 students participated in three courses, held between June and October. The other mobile laboratory has been in the Far East where it was used for courses in four cities in the Republic of Korea between April and September, attended by 177 students. In October the laboratory moved to China (Taiwan) where courses in three universities or institutes began, or are scheduled to take place, before the end of March 1961. It will then move to the Philippines for three months and will later go on to Indonesia, from July to November 1961.

150. The Agency's assistance in providing experts, equipment, fellowships, visiting professors and training courses, and the use of the Agency's mobile radioisotope laboratories, as described in paragraphs 136-149 above, is summarized in the following tables:

(i) Number of experts, fellowships and visiting professors under the 1960 and 1961 programs

	Experts		Fellowships		Visiting professors	
	Numbers	Man months	Numbers	Man months	Numbers	Man months
1960 Regular program	18[a]	73.5	344	4 340	17[b]	106
EPTA	22	100.5	85	785	-	-
TOTAL	40	174	429	5 125	17[b]	106
1961 Regular program	28[c]	222[c]	240[d]	2 500[d]	20[e]	110[e]
EPTA	67	376	51	586	-	-
TOTAL	95	598	291	3 086	20[e]	110[e]

a/ This figure represents the number of experts actually in the field during 1960 under the Regular Program.

b/ Including one extension.

c/ These figures relate to the program approved for implementation from 1961 resources subject to availability of funds.

d/ Estimated figures of fellowships financed by the Agency from the allocation of funds available at 31 March 1961 and of free fellowships.

e/ Estimate.

(ii) Approved cost of the experts, fellowships, visiting professors, training courses, mobile laboratories and equipment

	Experts	Fellowships	Visiting professors	Training courses	Mobile laboratories	Equipment
	$	$	$	$	$	$
1960 Regular program	298 339[a]	529 003	95 578	7 735	28 948	85 100[d]
EPTA	203 010[b]	305 899	-	-	-	83 462
TOTAL	501 349	834 902[c]	95 578	7 735	28 948	168 562
1961 Regular program	321 900[e, f]	650 000[f]	90 000[f]	60 000[f]	51 000[f]	191 200[e, f]
EPTA	530 380[g]	182 700[h]	-	[j]	-	102 100[i]
TOTAL	852 280	832 700	90 000	60 000	51 000	293 300

a/ This figure represents the cost of experts whose provision was approved by the Board in 1960 in connection with technical assistance projects; the implementation of some of these projects continues in 1961. The actual expenditure on experts in the field in 1960 amounted to $97 105.

b/ This figure shows the total cost of experts in the field in 1960 on Agency projects under EPTA.

c/ This figure represents the total expenditures and obligations under the 1960 Regular and EPTA fellowship programs. It does not include the cost of fellowships provided to the Agency free of cost and estimated by the Secretariat at approximately $990 000.

d/ This figure represents the value of equipment, the provision of which was approved by the Board in 1960 in connection with technical assistance projects; the implementation of some of these projects continues in 1961. The actual expenditure on equipment in 1960 amounted to $39 423. In addition, equipment in kind in the total value of $192 000 was provided by the United States.

e/ These figures relate to the program approved for implementation from 1961 resources, subject to availability of funds.

f/ These figures are based on the assumption that the target for voluntary contributions will be reached. The actual allotment so far as been:

- for experts and equipment . . . . . $ 310 000
- for fellowships . . . . . $ 330 000
- for visiting professors and training courses . . . $ 160 000
- for mobile radioisotope laboratories . . . . . $ 35 000

g/ The figure $530 380 includes $26 800 for experts for regional projects (training courses).

h/ The figure $182 700 includes $15 200 for fellowships for regional projects (training courses).

i/ The figure $102 100 includes $20 000 for equipment for regional projects (training courses).

j/ See also notes g, h and i: the total for the Agency's regional projects (training courses) under EPTA in 1961 amounts to $62 000.

B. Exchange of information

151. The Agency's work in the collection, exchange and distribution of information on the peaceful uses of atomic energy progressed further during the period under review.

152. Scientific conferences, symposia and seminars are an important means of exchanging information. During 1960 the Agency organized 12 such meetings on different subjects. Some of these were held outside Austria, at the invitation of Member States. This had the advantage of bringing the activities of the Agency to the attention of a wider public. Some were organized in co-operation with certain specialized agencies, when the subject matter was of common interest.

153. The meetings which were organized by the Agency in 1960 were attended by 1 911 participants from 54 Member States and 22 international organizations. Six hundred and eighty-eight papers were presented on various topics by scientists from 37 Member States and ten international organizations. The proceedings of the meetings are being published for distribution to Member States. The lists of conferences, symposia and seminars held in 1960 and those planned for 1961 are given in Annexes G and H respectively.

154. A number of the scientific publications of the Agency, such as the directories and manuals, compiled with the assistance of panels of experts, have been referred to earlier in this report. Many Member States have taken note of the recommendations made in these manuals, such as the Manual on the Safe Handling of Radioisotopes, together with two supplements, issued in 1960, which cover the health physics and medical aspects of safety practices to be employed when handling radioisotopes. Fifteen reviews on specific aspects of the peaceful applications of atomic energy have been prepared by experts, seven of which were published in 1960. Publication of a quarterly scientific journal entitled Nuclear Fusion: Journal of Plasma Physics and Thermonuclear Fusion, began in October 1960, and two issues were produced in the period under review.

155. The Agency has compiled 12 bibliographies on various aspects of the peaceful uses of atomic energy, two of which were published for general distribution in 1960. A third volume of the Directory of Nuclear Reactors was published, which contains detailed information on 96 research, test and experimental reactors at present in operation or under construction in 21 countries. Other publications include further sections of the world list of institutions concerned with atomic energy. The list of publications issued during the period under review is given in Annex I.

156. The Agency also acts as a reference center for information and abstracting services on nuclear science, which is able to assist scientific institutions in Member States and other interested organizations. By the end of 1960 the library had enlarged its collection to over 30 000 scientific and technical publications, and had supplied on request copies of scientific reports to 17 Member States.

C. Promotion of research and development

157. By the terms of its Statute the Agency is authorized to encourage research and to foster the development of nuclear energy for peaceful purposes. In addition to the limited research undertaken as an adjunct to the other work of its own laboratory, the Agency has continued to award research contracts to institutes throughout the world. The subjects under study include problems of radioactive waste disposal, health physics and radiation protection, radiobiology, safeguards methods, reactor safety studies, and the application of radioisotopes to agriculture and medicine. Research contracts serve the double purpose of seeking solutions to nuclear science problems of general interest and of stimulating national scientific advancement in countries embarking on atomic energy programs.

158. The research contract program of the Agency is, as far as is known, the first of its type to be undertaken on a broad international scale by an organization of the United Nations family. It has, therefore, been necessary to develop special procedures for the submission, consideration and award of contracts and for selecting subjects of research in the light of the Agency's Statute. Steps have also been taken to ensure co-ordination between institutions working on related research contracts, and arrangements made for the publication of the results of the contracts.

159. In addition to the funds available under the Agency's regular and operational budgets, the United States, during the period under review, entered into agreements with the Agency which provide for the payment of $170 764 to the Agency to finance a number of contracts on subjects and at institutions selected by the Agency. Of this sum, $121 214 had been used by 31 March 1961. Similarly, $10 000 were received from the Government of the Federal Republic of Germany to finance work in one special field; of this sum, $7 040 have so far been used for the award of two technical contracts.

160. The procedures so far developed for the administration of the research contract program provide, wherever possible, for direct contacts between interested scientific institutions and the scientific staff of the Agency. The results of the first contracts awarded (two or three years are often needed for the completion of a contract) are now becoming available. In a novel program of this kind certain initial problems have inevitably arisen, particularly with regard to the direction of research in the ways best fitted to meet the needs of the less-developed areas. Means of solving these problems are now being studied as part of a review of the program.

161. The Agency's experience may be of interest to specialized agencies which embark on similar types of program. The question of inter-agency co-ordination has not so far given rise to any serious problems in this field, but the need for it has been kept in mind and it may call for additional consultative arrangements if other agencies embark upon research contract programs in related fields. In the meantime the Agency is keeping the United Nations and the specialized agencies informed of the subjects of research.

162. The hundredth research contract under the Agency's program was awarded on 30 December 1960. During the period under review a total of 76 were awarded. Annex J shows the distribution of these contracts by subject matter and by country.

PART THREE

PROGRAM APPRAISAL

163. The Council in resolution 791 (XXX) requested that the consolidated report prepared by the Committee on Program Appraisals [4] be brought to the notice of the governing bodies or conferences of the participating organizations and that indication be given in future reports to the Council of the extent to which the trends foreseen in each agency's appraisal are being realized in fact.

A. Consolidated report

164. The Board of Governors of the Agency considered the consolidated report in February 1961. In submitting it to the Board, the Director General pointed out that the fundamental conclusion of the report is to reaffirm the urgent need for international action, on a far greater scale than at present, to promote the economic and social welfare of mankind. The report emphasized in particular that, while the very limited investment made so far by the United Nations family has borne a rich harvest, international economic, social and related action is "generally speaking not commensurate with effective demand, let alone emerging or only dimly perceived needs". [22]

165. The Director General also pointed out that the report stresses the need to strengthen the machinery for economic and technical planning in less-developed countries and repeatedly emphasized the importance of industrialization (and with it industrial research) as perhaps the main solution of the fundamental economic problems in most such countries. Note was also taken of the sections of the report dealing with the need for adequate supplies of energy, the importance of education, especially technical education, as one of the mainsprings of economic advance, and the report's conclusion that progress in international communication and exchange has not kept up with need and demand.

166. The Board has authorized the Director General to convey the following observations to the Council:

(a) The report provides an invaluable survey of the work of the United Nations family and draws attention to great possibilities so far unexploited, as well as to problems of organizing, financing and co-ordinating international activities which must be overcome if the United Nations system of organization is to play the full role which the needs of the modern world demand of it. The main conclusions of the report are in general applicable to the Agency's activities.

(b) With regard to the Agency's own appraisal, the development of nuclear technology must be seen in a somewhat longer perspective than the five-year period covered by the report. While all aspects of the Agency's program are dealt with in various parts of the report, the structure of the document and the nature of nuclear technology as a means to a wide diversity of economic and social ends, make it somewhat difficult to give full weight to the role of nuclear science or to obtain an integrated picture of the Agency's own activities.

167. To some extent the conclusions of the report have already been reflected in actions taken by the Agency. The report constantly points to the urgent need for increasing the financial, material and manpower resources at the disposal of the United Nations family. This concern has been reflected not only in actions of the Board and the General Conference in stressing the need for funds for the Agency's technical assistance and other operational activities, but more recently by resolution 1531 (X V) adopted by the General Assembly of the United Nations on 15 December 1960. This resolution urges the Agency to develop its program of technical assistance and to help the less-developed countries in the utilization of nuclear power for peaceful purposes and urges economically developed States to increase substantially their voluntary contributions to the Agency's General Fund.

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[22] United Nations document E/3347/Rev. 1, paragraph 349.

168. The vital importance of energy and power to economic development was also extensively reflected in discussions at the fourth regular session of the Agency's General Conference. These discussions culminated in the adoption of a resolution which called for the Board of Governors:

"(a) To continue carrying out nuclear power surveys in Member States, at their request, in accordance with the recommendations of resolution GC(III)/RES/57;

"(b) To pursue and develop such general studies of nuclear power costs, nuclear power costing methods and nuclear power evaluation methods as may appear advisable for the purpose of collecting, analyzing and distributing all relevant information on the subject, so as to harmonize the methods of evaluation; and

"(c) To report to the General Conference periodically, and in the first instance at its fifth regular session, on the results of these studies."

B. Extent to which the Agency's appraisal is being realized

169. Only one year has passed since the Agency's appraisal was prepared and it is still too early to make any definitive judgment about the extent to which the trends discerned in it will be realized in practice. So far most of the assessments made by the appraisal have been broadly correct. Thus, for instance, broad and general survey missions are being replaced by smaller and more specialized ones. The Agency's training activities are expanding somewhat faster than was foreseen but the research contract program, which is at present being reviewed, has in general followed the lines set forth in the appraisal. The Agency's work with regard to radiation protection and its associated regulatory work is also progressing along anticipated lines. The volume of scientific publications has expanded somewhat faster than was expected and a large proportion of the topics listed for scientific conferences during the five-year period will in fact have been covered by the end of 1962.

170. With regard to nuclear power and reactors, progress has been slow and the cautious predictions of the appraisal have been borne out. While the Agency has been associated with a number of hazards evaluations and other health and safety measures, the possibility held out in the appraisal that the Agency would have a main role in connection with power reactor projects and might assume responsibility for the supply of fuel, has not yet been realized.

171. There has been a considerable expansion, as foreseen, of research, technical assistance, and other activities associated with isotopes and radiation in medical, agricultural and other scientific applications, but apart from the conference on the Use of Radioisotopes in the Physical Sciences and Industry (see paragraphs 84-86 above), relatively little work has been done in connection with their industrial applications. The completion of the Agency's main laboratory has been delayed by about six months but the small laboratory in the headquarters building is now well equipped and fully functioning, and additional laboratory facilities have become available in Monaco (see paragraph 101 above).

172. Other trends indicated in the appraisal are also being borne out in practice. There has been, for example, expanding co-operation with the regional economic commissions of the United Nations as the Agency's technical assistance program has expanded. The appraisal also foreshadowed the need for closer co-operation with autonomous intergovernmental organizations outside the United Nations family, dealing with the peaceful uses of atomic energy, and this has been reflected already in the conclusion of two relationship agreements (see paragraph 34 above).

173. The Agency's comments on the survey of the main trends of inquiry in the natural sciences which the Council requested in resolution 804 B (XXX)[6], will be transmitted in a separate document. Nuclear science is one of the natural sciences in question and in a sense the Agency's comments on the survey are complementary to the appraisal of its own program. Both these documents have given the Board the opportunity to consider some of the long-term perspectives of the Agency's work and various other questions of long-term planning are also being discussed.

ANNEX A

NON-GOVERNMENTAL ORGANIZATIONS HAVING CONSULTATIVE STATUS WITH THE AGENCY

(at 31 March 1961)

European Confederation of Agriculture

International Air Transport Association

International Cargo Handling Co-ordination Association

International Chamber of Commerce

International Commission on Radiological Protection

International Commission on Radiological Units and Measurements

International Confederation of Free Trade Unions

International Co-operative Alliance

International Council of Scientific Unions

International Federation of Christian Trade Unions

International Federation of Documentation

International Federation of Industrial Self-Consuming Producers of Electricity

International Organization for Standardization

International Union for Inland Navigation

International Union of Producers and Distributors of Electrical Energy

Japan Atomic Industrial Forum, Inc.

World Federation of United Nations Associations

World Power Conference

ANNEX B

CONTRIBUTIONS TO THE GENERAL FUND FOR 1960

(as at 31 March 1961)

Member State	Amount pledged[a/]	Amount paid[a/]
	$	$
AUSTRALIA	12 500	12 500
AUSTRIA	5 000	5 000
BRAZIL	15 000	15 000
BULGARIA	735	-
BURMA	1 000	1 000
CANADA	50 000	50 000
CEYLON	1 250	1 250
CHINA	5 000	5 000
CZECHOSLOVAK SOCIALIST REPUBLIC	13 888	13 888
DENMARK	8 400	8 400
FINLAND	5 000	5 000
FRANCE	30 612	30 612
GERMANY, FEDERAL REPUBLIC OF	40 000	40 000
GREECE	2 500	2 500
HOLY SEE	2 000	2 000
INDIA	20 000	-
ISRAEL	1 111	1 111
ITALY	30 000	30 000
JAPAN	22 000	22 000
KOREA, REPUBLIC OF	2 000	2 000
MEXICO	5 000	5 000
MONACO	2 000	2 000
NETHERLANDS	12 500	12 500
NORWAY	7 000	7 000
PAKISTAN	4 000	4 000
PHILIPPINES	2 000	2 000
PORTUGAL	3 500	3 500
SWEDEN	20 000	20 000
SWITZERLAND	11 628	11 628
TURKEY	4 444	4 444
UNION OF SOUTH AFRICA	10 000	10 000
UNITED ARAB REPUBLIC	10 135	10 135
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND	125 000	125 000
UNITED STATES OF AMERICA	500 000	500 000
VENEZUELA	6 900	6 900
YUGOSLAVIA	4 000	4 000
TOTAL	996 103	975 368

a/ Pledges and payments are expressed in United States dollars for ease of comparison, any necessary conversions having been made at Technical Assistance Board rates.

ANNEX C

CONTRIBUTIONS TO THE GENERAL FUND FOR 1961

(as at 31 March 1961)

Member State	Amount pledged[a]	Amount paid[a]
	$	$
ARGENTINA	15 000	15 000
AUSTRALIA	20 000	20 000
AUSTRIA	5 000	
BRAZIL	30 000	30 000
CANADA	52 020	
CEYLON	2 100	
CHINA	5 000	
CZECHOSLOVAK SOCIALIST REPUBLIC	[b]	
DENMARK	10 080	
FINLAND	6 000	6 000
FRANCE	30 000	
GERMANY, FEDERAL REPUBLIC OF	50 000	25 000
GREECE	2 500	
INDIA	25 000	
IRAQ	3 000	3 000
ISRAEL	2 222	
ITALY	[c]	
JAPAN	25 000	
KOREA, REPUBLIC OF	3 000	
MEXICO	7 500	
MONACO	42 000	2 000
NETHERLANDS	15 000	
NORWAY	8 100	
PAKISTAN	6 000	
PHILIPPINES	3 000	
POLAND	4 167	
PORTUGAL	3 500	
SWEDEN	20 000	
SWITZERLAND	11 521	
THAILAND	2 700	
UNION OF SOUTH AFRICA	15 000	
UNION OF SOVIET SOCIALIST REPUBLICS	[b]	
UNITED ARAB REPUBLIC	11 261	
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND	140 000	
UNITED STATES OF AMERICA	500 000	
VENEZUELA	8 200	
YUGOSLAVIA	5 000	
	1 088 871	101 000
UNITED STATES OF AMERICA (Matching contribution)	88 871	-
TOTAL	1 177 742	101 000

a/ Pledges and payments are expressed in United States dollars for ease of comparison, any necessary conversions having been made at Technical Assistance Board rates.

b/ The pledge will depend on the utilization of funds put at the Agency's disposal in previous years.

c/ Amount to be announced later.

A N N E X D

1960 FELLOWSHIP NOMINATIONS, AWARDS AND PLACEMENTS 1/

Nominating Country \ Host Country	Nominations received		Argentina	Australia	Austria	Belgium	Brazil	Canada	Czechoslovak Socialist Republic	Denmark	France	Germany, Federal Republic of	India	Israel	Italy	Japan	Netherlands	New Zealand	Norway	Pakistan	Poland	Romania	Spain	Sweden	Switzerland	United Arab Republic	Union of Sov. Soc. Rep.	United Kingdom	United States of America	Yugoslavia	CERN	IAEA	Rejected	TOTAL AWARDS
Afghanistan	5							1				1													1				1				1	5
Argentina	40										5				3		2											4	9					23
Austria	17							1				3															1		3			3		11
Brazil	11					1				1		1			2										1				4					10
Bulgaria	19					2					4	3												1				2	3				2	17
Burma	4												1																1					2
Chile	2																												1					1
Ceylon	2																											2						2
China	20			1				1								7													4					13
Colombia	4																												2					2
Czechoslovak Socialist Republic	20					1		2								1									1			5	3	1	1			15
Finland	3																							1				1	1					3
France	1																																	0
Germany, Federal Republic of	1																																	0
Greece	23					1		2			1						1											5	2	2				14
Hungary	34							1		1	3	5												2			1	6	4				4	27
India	15							1		1																	2	1	5					10
Indonesia	41			1					2							2			1			4					9	3	4					26
Iran	21			1		1			2	1	2								1					1			1	3	3					16
Iraq	11				1			1								1											1	2	1				1	8
Israel	2																											1	1					2
Italy	22							2			2														1		1	3	4					13
Japan	38			1				2			2	2							1									6	9				2	25
Korea, Republic of	26			3				1				2												1				2	2				1	12
Mexico	4		1					1																					1					3
Morocco	1																										1							1
Netherlands	4																												3					3
New Zealand	2																												1					1
Nicaragua	1																												1					1
Norway	1																											1						1
Peru	4						1								1														1					3
Philippines	17			3				2								1												3	4			1		14
Poland	35							2		2	3	4					1							1			1	4	5	1			1	25
Spain	15		1			1					2				1													1	2				1	9
Switzerland	1										1																							1
Thailand	27			1				1								2										1		2	3					10
Tunisia	1										1																							1
Turkey	40							1			1	2												1			3	1	7				3	19
Union of South Africa	11					1											1											2	4					8
United Arab Republic	26			1		1		2				1				1								1				3	5				3	18
Venezuela	2																												1					1
Vietnam	1																																	0
Yugoslavia	73				1	2		3	1		10	6			3		1								1		2	10	9		1		3	53
TOTAL	648		2	12	2	11	1	27	5	6	37	30	1	0	10	15	6	0	3	0	0	4	0	9	5	1	23	73	114	4	2	4	22	429

1/ *In some cases the placements are awaiting confirmation.*

ANNEX E

FELLOWSHIPS TO BE FINANCED BY MEMBER STATES, OFFERED TO THE AGENCY FOR 1960 AND 1961[a/]

Member State	1960	1961
BELGIUM	7	7
BRAZIL	30	
CZECHOSLOVAK SOCIALIST REPUBLIC	15	15[b/]
DENMARK	4-5	4-5
FINLAND		2
FRANCE	12	
GERMANY, FEDERAL REPUBLIC OF	-	9-10
INDIA	5	5[c/]
ITALY	10	10
JAPAN	20-30	[d/]
NETHERLANDS		3
SPAIN		5
UNION OF SOVIET SOCIALIST REPUBLICS	10[e/]	
UNITED ARAB REPUBLIC		6
UNITED STATES OF AMERICA	100	50
YUGOSLAVIA	5	

a/ This Annex covers those offers of fellowships for the 1960 and 1961 fellowship programs received by the Agency by 31 March 1961.

b/ Includes fellowships continued from previous years.

c/ The Government of India has offered five fellowships at a time on a continuing basis.

d/ Number under consideration.

e/ Number remaining from the original offer of 25 five-to-six-year fellowships made in 1958.

ANNEX F

OFFERS OF EXPERTS RECEIVED

Member State	Number of experts offered	Expense to the Agency
ARGENTINA	a/	none
AUSTRALIA	a/	a/
BELGIUM	a/	a/
CANADA	a/	Canada will pay as their financial provisions permit
CZECHOSLOVAK SOCIALIST REPUBLIC	10	a/
DENMARK	a/	a/
FRANCE	5-10	Agency or recipient countries to pay
INDIA	a/	a/
ISRAEL	a/	a/
ITALY	a/	a/
JAPAN	2	none
SWITZERLAND	a/	a/
UNION OF SOUTH AFRICA	a/	a/
UNION OF SOVIET SOCIALIST REPUBLICS	20-30	none
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND	a/	a/
UNITED STATES OF AMERICA	20-30	none
YUGOSLAVIA	20	a/

a/ Not specified.

ANNEX G

CONFERENCES, SEMINARS AND SYMPOSIA HELD IN 1960

Date	Title	Place	Co-sponsoring organizations
Conferences			
5-9 September	Conference on Small and Medium Power Reactors	Vienna	
6-17 September	Conference on the Use of Radioisotopes in the Physical Sciences and Industry	Copenhagen, Denmark	UNESCO
Seminars			
25-29 April	Seminar on Codes for Reactor Computations	Vienna	
Symposia			
10-13 May	Symposium on Fuel Element Fabrication, with Special Emphasis on Cladding Materials	Vienna	
7-11 June	Symposium on Selected Topics in Radiation Dosimetry	Vienna	
8-12 August	Symposium on the Effects of Ionizing Radiation on Seeds and their Significance for Crop Improvement	Karlsruhe, Federal Republic of Germany	FAO
11-14 October	Symposium on Inelastic Scattering of Neutrons in Solids and Liquids	Vienna	
17-21 October	Symposium on Pile Neutron Research in Physics	Vienna	
24-27 October	Symposium on the Chemical Effects of Nuclear Transformations	Prague, Czechoslovak Socialist Republic	
14-18 November	Symposium on Nuclear Ship Propulsion with Special Reference to Nuclear Safety	Taormina, Italy	IMCO
5-9 December	Symposium on Radioisotopes and Radiation in Entomology	Bombay, India	
12-16 December	Symposium on the Use of Radioisotopes in the Study of Endemic and Tropical Diseases	Bangkok, Thailand	WHO

ANNEX H

PROVISIONAL PROGRAM OF CONFERENCES, SEMINARS AND SYMPOSIA TO BE HELD IN 1961

Date	Title	Place	Co-sponsoring organizations
Conferences			
15-20 May	Conference on Nuclear Electronics	Belgrade, Yugoslavia	
4-8 September	Conference on Plasma Physics and Controlled Nuclear Fusion Research	Salzburg, Austria	
21 November-1 December	Conference on the Use of Radioisotopes in Animal Biology and the Medical Sciences	Mexico City	FAO WHO
Seminars			
3-11 August	Seminar on the Physics of Fast and Intermediate Reactors	Vienna	
6-10 November	Regional Seminar on Educational Problems of Nuclear Energy	San Carlos de Bariloche, Argentina	IANEC UNESCO
Symposia			
3-10 May	Symposium on the Detection and Use of Tritium in the Physical and Biological Sciences a/	Vienna	
5-9 June	Symposium on the Effects of Ionizing Radiation on the Nervous System	Vienna	
12-16 June	Symposium on Whole Body Counting	Vienna	
16-20 October	Symposium on the Programming and Utilization of Research Reactors	Vienna	
23-27 October	Symposium on Power Reactor Experiments	Vienna	

a/ Organized in co-operation with the Joint Commission on Applied Radioactivity (of ICSU).

ANNEX I

AGENCY PUBLICATIONS

(16 April 1960 - 31 March 1961)

1. Proceedings of Conferences, Symposia, Seminars and Panels

Codes for Reactor Computations

Disposal of Radioactive Wastes, two volumes

Education and Nuclear Energy

Large Radiation Sources in Industry, two volumes

Liability of Operators of Nuclear Ships

Metrology of Radionuclides

Radiation Damage in Bone

Radioactive Substances in the Biosphere

Use of Radioisotopes and Supervoltage Radiation in Radioteletherapy

2. Directories

Directory of Equipment for Radioisotope Applications

Directory of Nuclear Reactors, third volume

3. Manuals

Management Control of Special Materials in Nuclear Installations

Safety Series, No. 2 : Safe Handling of Radioisotopes - Health Physics Addendum

Safety Series, No. 3 : Safe Handling of Radioisotopes - Medical Addendum

4. Series and Periodicals

Application of High Energy Radiations in Therapy

Atomic Energy : Conferences, Meetings, Training Courses

List of Bibliographies on Nuclear Energy

List of References on Nuclear Energy

Mass Spectrometry for Uranium Isotopic Measurements

Nuclear Fusion - Journal of Plasma Physics and Thermonuclear Fusion : Vol. 1, No. 1

Nuclear Reactors

Prospects of Nuclear Power in Finland

Recent Research on Controlled Thermonuclear Fusion

Research, Experimental and Test Reactors

The Application of Radioisotopes in Biology

The Behaviour of Reactor Components under Irradiation

World List of Institutions concerned with Atomic Energy :
Netherlands, New Zealand, Switzerland, United Kingdom

5. Miscellaneous

Assistance through Fellowship and Exchange Programme in Nuclear Science

International Atomic Energy Agency Bulletin : Vol. II, Nos. 2, 3, 4, Vol. III, No. 1 and one Special Number

Preliminary Assistance Mission Reports on Greece, Ivory Coast, Federation of Mali, Morocco, Sudan, Tunisia

Publications Catalogue - Nos. 2 and 3

ANNEX J

RESEARCH CONTRACTS

I

Research contracts awarded and renewed during the period under review to institutions in the countries indicated

Country	New contracts	Renewed contracts
AUSTRALIA	2	-
AUSTRIA	3	4
BELGIUM	2	-
BRAZIL	1	-
CHILE	1	-
CHINA	2	-
CZECHOSLOVAK SOCIALIST REPUBLIC	2	1
DENMARK	1	-
FINLAND	-	1
FRANCE	2	3
GERMANY, FEDERAL REPUBLIC OF	2	-
GREECE	-	1
HUNGARY	1	-
INDIA	2	-
IRAQ	-	1
ISRAEL	1	-
ITALY	6	2
JAPAN	2	4
NETHERLANDS	1	1
NORWAY	-	2
PHILIPPINES	-	1
POLAND	1	1
PORTUGAL	1	-
SPAIN	1	-
SWEDEN	-	1
SWITZERLAND	-	2
THAILAND	1	-
UNION OF SOUTH AFRICA	2	-
UNITED ARAB REPUBLIC	2	-
UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND	6	2
UNITED STATES OF AMERICA	3	-
YUGOSLAVIA	-	1
TOTAL	48	28

II

Research contracts awarded and renewed during the period under review, arranged by subject matter

Subject matter of research	New contracts	Renewed contracts
Safe disposal of radioactive waste	11	6
Health physics and radiation protection	10	6
Radiobiology	14	11
Safeguards methods	2	-
Power reactor studies	1	-
Application of radioisotopes in:		
(a) Medicine	2	3
(b) Agriculture	5	2
Miscellaneous	3	-
TOTAL	48	28