# THE AGENCY'S PROGRAMME FOR 1981 - 1986 AND BUDGET FOR 1981

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INTERNATIONAL ATOMIC ENERGY AGENCY

THE AGENCY'S PROGRAMME FOR 1981–86 AND BUDGET FOR 1981

CONTENTS

## LIST OF ABBREVIATIONS

| | |
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| ACABQ | Advisory Committee on Administrative and Budgetary Questions (of the General Assembly of the United Nations) |
| ACSAD | Arab Centre for the Study of Arid Zones and Dry Lands |
| AG | Advisory Group |
| Agency | International Atomic Energy Agency |
| AGRIS | Agricultural Information System |
| CANDU | Canadian deuterium-uranium [reactor] |
| CCAQ | Consultative Committee on Administrative Questions |
| CEC | Commission of the European Communities |
| CINDA | Computer Index of Neutron Data |
| CMEA | Council for Mutual Economic Assistance |
| DANIDA | Danish International Development Agency |
| EAAFRO | East African Agriculture and Forestry Research Organization |
| ECE | Economic Commission for Europe (of the United Nations) |
| ECOSOC | Economic and Social Council of the United Nations |
| EPPO | European and Mediterranean Plant Protection Organization |
| ESNA | European Society for Nuclear Methods in Agriculture |
| EUCARPIA | European Association for Research on Plant Breeding |
| EURATOM | European Atomic Energy Community |
| EXFOR | Exchange Format for Neutron Data |
| FAO | Food and Agriculture Organization of the United Nations |
| GS | General Service category (staff) |
| GSF | Gesellschaft für Strahlen- und Umweltforschung (Federal Republic of Germany) |
| HTGR<br>HTR | High-temperature gas-cooled reactor |
| IAEA | International Atomic Energy Agency |
| IATA | International Air Transport Association |
| IBRD (World Bank) | International Bank for Reconstruction and Development |
| ICAO | International Civil Aviation Organization |
| ICARDA | International Centre for Agricultural Research in the Dry Areas |
| ICIPE | International Centre for Insect Physiology and Ecology (Nairobi) |
| ICRISAT | International Crop Research Institute for the Semi-arid Tropics |
| ICRP | International Commission on Radiological Protection |
| ICRU | International Commission on Radiation Units and Measurements |
| ICSC | International Civil Service Commission |
| ICSU | International Council of Scientific Unions |
| IEA | International Energy Agency |
| IFFIT | International Facility for Food Irradiation Technology |

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| IFIP | International Project in the Field of Food Irradiation |
| IFRC | International Fusion Research Council |
| IIASA | International Institute for Applied Systems Analysis |
| IITA | International Institute for Tropical Agriculture |
| ILCA | International Livestock Centre for Africa |
| ILO | International Labour Organisation |
| ILRAD | International Laboratory for Research on Animal Disease |
| IMCO | Inter-Governmental Maritime Consultative Organization |
| INDC | International Nuclear Data Committee |
| INFCE | International Nuclear Fuel Cycle Evaluation |
| INIS | International Nuclear Information System |
| IOBC | International Organization for Biological Control of Noxious Animals and Plants |
| IRRI | International Rice Research Institute |
| ISO | International Organization for Standardization |
| IUPAC | International Union of Pure and Applied Chemistry |
| Joint FAO/IAEA Division | Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy in Food and Agricultural Development |
| LWR | Light-water reactor |
| M&O | Maintenance and Operatives Service category (staff) |
| MHD | Magnetohydrodynamics |
| Monaco Laboratory | International Laboratory of Marine Radioactivity (at Monaco) |
| NDA | Non-destructive assay |
| NEA | Nuclear Energy Agency (of OECD) |
| NPT | Treaty on the Non-Proliferation of Nuclear Weapons (reproduced in document INFCIRC/140) |
| NUSS programme | Agency's programme on nuclear safety standards for nuclear power plants |
| OECD | Organisation for Economic Co-operation and Development |
| P | Professional category (staff) |
| PNE | Nuclear explosions for peaceful purposes |
| RCA | Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology |
| SABRAO | Society for the Advancement of Breeding Research in Asia and Oceania |
| SAC | Scientific Advisory Committee |
| SAL | Safeguards Analytical Laboratory |
| Salzburg Conference | International Conference on Nuclear Power and its Fuel Cycle |
| SAREC | Swedish Agency for Research Co-operation with Developing Countries |
| SCOPE | Scientific Committee on Problems of the Environment |
| SIDA | Swedish International Development Authority |
| TC | Technical Committee |
| TECDOC | Document in Technical Document Series |
| Tlatelolco Treaty | Treaty for the Prohibition of Nuclear Weapons in Latin America |

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| Trieste Centre | International Centre for Theoretical Physics (at Trieste) |
| UNCNRET | United Nations Centre for Natural Resources, Energy and Transport |
| UNDP | United Nations Development Programme |
| UNDRO | Office of the United Nations Disaster Relief Co-ordinator |
| UNEP | United Nations Environment Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UNICEF | United Nations Childrens' Fund |
| UNIDO | United Nations Industrial Development Organization |
| UNIPEDE | International Union of Producers and Distributors of Electrical Energy |
| UNRWA | United Nations Relies and Works Agency for Palestine Refugees in the Near East |
| UNSCEAR | United Nations Scientific Committee on the Effects of Atomic Radiation |
| US-AID | United States Agency for International Development |
| USDA | United States Department of Agriculture |
| USDOE (USDE) | United States Department of Energy |
| VIC | Vienna International Centre |
| WASP | Wien Automatic System Planning Package |
| WEC | World Energy Conference |
| WHO | World Health Organization |
| WMO | World Meteorological Organization |
| World Bank (IBRD) | International Bank for Reconstruction and Development |

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NOTE

All sums of money are expressed in United States dollars.

# INTRODUCTION

## General

1. In accordance with Article XIV.A of the Statute, the Board of Governors hereby submits to the General Conference the budget estimates for 1981, the preliminary estimates for 1982 and 1983 and the Agency's programme of work for the six-year period 1981–86. The Board requests the Conference to adopt the draft resolutions set forth in Annex VI.

2. The estimates for 1982 and 1983 are based on conditions and trends as known now and are presented as preliminary estimates only. Final budget estimates for 1982 will be presented to the General Conference at its twenty-fifth regular session, with supporting programme explanations if significant changes have occurred. Adjustments to the preliminary figures may be necessary as a result of changes in programme emphasis or of factors outside the control of the Agency.

## Format

3. The previous presentation of separate tables for the Regular and Operational Budgets and for Extrabudgetary Resources has been changed; in this document Table 1 presents the Agency's Consolidated Budget for 1981, consisting of the Regular Budget, the Technical Assistance Fund and Extrabudgetary Resources. The new presentation shows in one table the total cash resources that are estimated to be available to the Agency in 1981. Further, it provides a better basis to evaluate the budget estimates for administrative activities proposed in the Regular Budget since these administrative activities support not only the programme activities of the Regular Budget, but also the activities under the Technical Assistance Fund and the activities funded from Extrabudgetary Resources.

4. Separate presentation of the Operational Budget has been discontinued, as discussed below. In previous budget documents, the Operational Budget consisted of the General Fund, Operating Fund I and Operating Fund II.

5. The General Fund and Operating Fund II are both entirely in support of the Agency's Technical Assistance programme. The two funds have been combined in a single presentation and entitled "Technical Assistance Fund"; all Technical Assistance activities other than the administrative activities, which are provided for in the Regular Budget, are thereby presented in a single fund.

6. Operating Fund I, as a separate entity, has been discontinued in order to improve the presentation in respect of the International Centre for Theoretical Physics (Trieste Centre) and the International Laboratory of Marine Radioactivity (Monaco Laboratory). In the past, Operating Fund I covered only that portion of the budget of the Trieste Centre and the Monaco Laboratory which was funded from special contributions by Member States and United Nations organizations. The previous presentation led to confusion because the Operating Fund I figures were also included, but not always separately identified, in the Regular Budget both in the table "by programme" and in the table "by item of expenditure". Under the new presentation, the Regular Budget figures in Tables 1, 2 and 3 are consistent and include only the Regular Budget support for the Trieste Centre and the Monaco Laboratory. The special contributions by Member States and United Nations organizations are now shown in the Consolidated Budget, Table 1, under the heading "Extrabudgetary Resources". In addition, the total financial position of the Trieste Centre, including all sources of funding, is presented in Annex V by items of expenditure. The appropriateness of the new presentation has been suggested by the External Auditor in the context of the Agency's Accounts.

7. As a consequence of the changes described in the three foregoing paragraphs, the draft resolution set forth in Annex VI.B, "Technical Assistance Fund Allocation for 1981" is modified accordingly.

8. In order to have a clearer presentation for the Regular Budget, the item "Transfer of costs" has been deleted from Table 3, the Regular Budget by item of expenditure. The "Transfer of costs" figures were related to linguistic services and printing and publishing services associated with meetings and they were always minus figures, deductions being necessary because the transferred costs were duplicated under various items of expenditure in the table. In the new presentation, the costs involved are shown in Table 3 only once and are included as part of "Meetings" costs in order to show the full costs of meetings in accordance with United Nations practice. The duplication of figures, primarily in established posts, temporary assistance and common staff costs, has been eliminated.

9. In compliance with proposals made by the governing bodies of the Agency for improved mid-term budgetary planning, preliminary estimates for the two years following the budget year have been included for the first time in this budget document.

10. In Tables 2 and 3 a sub-total entitled "Agency programmes" has been introduced in order to isolate "Cost of work for others", which is offset entirely by the portion of miscellaneous income identified separately as "Income from work for others". The total figures for the Agency programmes represent the changes in the programme activities of the Agency better than do the total figures for the Regular Budget.

11. In order to assist the Board of Governors and the General Conference in considering the need for meetings of Technical Committees, Advisory Groups and consultants and to facilitate future follow-up of the approved programme, new tables have been introduced at the end of certain programme chapters describing the products expected from such meetings. [1]

Programme trends

12. The character and direction of the "Technical Assistance" programme will reflect and will continue to be primarily determined by the type of activities requested by Member States. New concepts such as multi-year projects and programming in accordance with the type of currency resources available, which were successfully introduced in the 1979 programme, will be continued and – where possible – expanded in the coming years. Efforts will be made to stimulate Member States' interest in regional activities and to formulate programmes of this nature which could be linked with sources of financing such as UNDP. Increased attention will be given to UNDP country programmes in order to identify projects where the Agency could play an associate role in the introduction of nuclear techniques in various fields. To cope with the increasing complexities and volume of the programme, the present system of technical assistance data processing and computer reporting is being redesigned; a new system will be introduced in stages, starting at the end of 1980. From 1983 onwards this will have the effect of significantly enhancing the Agency's capacity to manage the programme and to provide promptly and in detail any specific data requested by Member States on technical assistance activities.

13. In the area of nuclear power and its fuel cycle, the International Nuclear Fuel Cycle Evaluation (INFCE) has produced valuable information and resulted in the delineation of problem areas. Uncertainties in nuclear power and nuclear fuel cycle policies and programmes in Member States continue to hamper the forecasting of the demand for and supply of nuclear power, nuclear fuel and nuclear fuel cycle services. It is therefore intended to further improve methods for collecting and analysing demand, supply and other relevant data and to continue updating information on national nuclear programmes in order to provide a basis for future studies by the Agency or Member States.

14. The accident at Three Mile Island has highlighted the need for increased emphasis on the problems of plant safety and reliability, and this will be reflected in the programme trends. In the manpower development area, the question of safety-related qualifications will receive increased attention. Assistance to Member States in nuclear power programme formulation and implementation will place emphasis on infrastructure requirements in terms of organization, manpower and industrial support. Uranium exploration and the improvement of mining and milling technology will be areas of major attention as a result of current interest in expanding the supply of uranium, including uranium from new and lesser-known sources. The main effort relating to nuclear fuel element technology for water and advanced reactors will be concentrated on quality assurance and quality control during fuel fabrication and on improvements in fuel utilization and in the reliability and safety of fuel performance. Activities in spent fuel management will focus on intermediate-term storage. In the areas of advanced nuclear power technology, arrangements will continue to be made to facilitate the information exchange between Member States on the development of those reactor systems which could make a major contribution to future world energy supplies. These include fast-breeder and advanced-converter reactors and even fusion reactors. The work of the relevant International Working Groups, which have been playing a useful information exchange role with regard to advanced nuclear power technology, will be examined with a view to further enhancing their usefulness. Activities in reactor physics related to the safety of power reactor operation will be continued for the benefit of developing countries, but other subjects in reactor physics research and work on MHD electrical power generation will be phased out.

[1] The form of the documents shown in the programme product tables is not necessarily final, because all Agency documents intended for publication have to be approved by the Publications Committee. The entries under "Schedule" in the tables indicate the type of meeting, the year it is to be held and (where appropriate) its serial number in the list that follows each table.

15. Under the "Nuclear Safety" programme, the Agency's Basic Safety Standards and allied documents will be revised in the light of the latest ICRP recommendations. A comprehensive review of the Agency's regulations for the safe transport of radioactive materials will result in the publication of a revised document in 1983. Transport accident statistics will be collected and will form part of the input to transport risk assessment studies. A major body of technical documentation will be completed on the underground disposal of radioactive wastes and the development of codes and guides in this area will be undertaken as soon as the maturity of the various topics warrants such a step. Technical guidance on waste management at the various stages of the nuclear fuel cycle will also be produced or updated. The programme on radiation protection of the environment will be strengthened through the preparation of documents on limiting the release of effluents or the dispersion of wastes into the environment. The scope of the programme in nuclear safety will be enlarged to incorporate activities initiated in 1979 under the supplementary nuclear power safety programme. The appropriate funds have been included in the draft budget for 1981 and the preliminary estimates for 1982. It is hoped that Member States will continue to support this programme by providing cost-free experts. With the planned completion by 1982 of five codes and about fifty guides, the first phase of the Nuclear Safety Standards (NUSS) programme will be finished. There will then be an increase in the number of training courses and safety missions designed to assist Member States in implementing the safety principles set forth in those documents. The Agency's capabilities for rendering assistance in emergencies will be reviewed and strengthened and its capacity to render assistance to Member States in establishing national and regional emergency plans will be expanded. Data on significant abnormal operating experience with nuclear power plants will be collected and reviewed and selected specific occurrences will be evaluated.

16. In addition to the "Information and Technical Services" programme, the activities of the Department of Technical Operations have focussed in recent years on the provision of support for the development and implementation of national nuclear power programmes, on nuclear safety and on the nuclear fuel cycle. It is now planned to reorganize the Department in 1981 on the basis of these broad categories. Consequently, the Division of Nuclear Power and Reactors and the Division of Nuclear Safety and Environmental Protection will be transformed into three Divisions: the Division of Nuclear Power, the Division of Nuclear Safety and the Nuclear Fuel Cycle Division.

(1) The proposed Division of Nuclear Power will embrace the "Energy forecasts and economic assessment of nuclear power and its fuel cycle", "Nuclear power programme implementation", "Technology of nuclear power plants of proven types" and "Advanced nuclear power technology" sub-programmes of the present Division of Nuclear Power and Reactors.

(2) The subject of nuclear safety, which has undergone major expansion in recent years, will be the responsibility of a separate Division concerned solely with the safe utilization of nuclear energy and with the protection of man and the environment. This is in line with suggestions made by several Member States in the spring of 1979, when they proposed giving the safety of nuclear plants priority treatment in the Agency's programme, which should include an objective study on the safety of nuclear power plants and intensified international co-operation in safety research. In the new Division, increased emphasis will be given to safety standards and their implementation, advisory services, the exchange of information (on safety research and operating experience) and the provision of training and emergency assistance. The Division will be responsible for co-ordination of the safety-related aspects of other Agency activities such as training courses and expert assignments in the technical assistance area. It will embrace the "Radiological safety", "Nuclear safety" (renamed "Safety of nuclear installations") and "Radiation protection service" sub-programmes of the present Division of Nuclear Safety and Environmental Protection.

(3) The increasing interest of Member States in various aspects of the nuclear fuel cycle, as evidenced by INFCE, justifies integration of the different aspects of the Agency's work on this subject into a separate Nuclear Fuel Cycle Division. This will be concerned solely with the various stages of the nuclear fuel cycle (nuclear materials prospecting and mining, uranium conversion and enrichment, fuel element fabrication, spent fuel storage, reprocessing, and uranium and plutonium recycling) and with the closely related management and disposal of radioactive wastes. The Division will thus embrace the "Nuclear materials and fuel cycle technology" sub-programme of the present Division of Nuclear Power and Reactors and the "Waste management" sub-programme of the present Division of Nuclear Safety and Environmental Protection.

17. The present interest of Member States in research and development work on nuclear explosions for peaceful purposes seems to be extremely limited and the Agency's work in this area will therefore, for the time being, be kept at a minimum.

18. Under the "Food and Agriculture" programme, it is planned to continue work in the main areas where nuclear techniques have become established as indispensable tools. The mass-rearing facility in Mexico is expected to bring about a breakthrough in the large-scale application of the sterile-insect technique against fruit flies, especially the Mediterranean fruit fly (medfly). This facility is expected to be operating at full capacity by late 1981, when it will be

able to conduct most of the research and development necessary to maintain its own programme. It is understood that laboratory expertise gained in the Mexican programme will be made available to Member States engaged in campaigns against the medfly, and the Agency Laboratory's back-up work on this insect will therefore be phased out during 1981. However, the Agency will, if necessary, be able to give assistance in this field, largely through training and the provision of expert services and equipment and by supporting research on selected subjects. Work will continue on tsetse fly rearing techniques, mainly as back-up for a large-scale field project in Nigeria.

19. In the field of food irradiation, ways and means will be studied of promoting acceptance of the food irradiation process and facilitating the commercialization of irradiated foodstuffs. However, progress in these areas ultimately depends on actions to be taken by Member States. The scope and orientation of the "Food preservation" sub-programme will be reviewed to take into account the termination of the agreements concerning IFFIT (1983) and IFIP (1981).

20. Under the "Life Sciences" programme, it is planned to organize a range of activities in collaboration with WHO on the improved quality control and maintenance of nuclear medicine instruments in South East Asia and Latin America. An in vitro counting system optimized for use in developing countries will be further evaluated for performance under field conditions as part of a programme of quality control of thyroid hormone assay. Assistance, mainly in the form of dose intercomparison and calibration services, will continue to be given to the network of 40 Secondary Standard Dosimetry Laboratories in Member States. Work aimed at achieving the standardization of dosimetry methods and the development of dosimetry systems for high doses and dose rates in the areas of food preservation and medical product sterilization will continue. In radiation biology and environmental health, the emphasis will be on the development of radiation and nuclear methods for use in health care and in the assessment of pollutants in human material and on the development of nuclear-based analytical techniques for the assessment of hazards from conventional sources of energy, especially fossil fuels. Work on the treatment of industrial and municipal sewage will be phased out.

21. The "Physical Sciences" programme will be oriented more towards the practical use of radiation and isotopic methods in developing countries. Meetings of experts, co-ordinated research programmes, technical missions and training courses will be directed mainly towards this end. Those activities associated with the application of isotopes and nuclear methods in industry which are directly related to the Agency's assistance to developing countries will continue, but other activities in this area will be phased out. It is also planned to phase out work on pure and applied chemistry related to separation methods in the nuclear fuel cycle and in waste management and on the pure chemistry of nuclear materials for reactors and the nuclear fuel cycle. Assistance in the conversion of research reactors from highly enriched to low-enriched fuel will continue. The main goal in plasma physics and controlled fusion is to promote international co-operation and the co-ordination of national fusion programmes in order to achieve the practical demonstration of fusion power. In this connection, the International Tokamak Reactor (INTOR) project, which started in 1979, will continue. Increased emphasis will be given to the improvement of nuclear reference data used in radiation damage and safety studies, waste management, safeguards and fusion research. Work will continue on providing nuclear data for national nuclear programmes in developing countries and atomic and molecular data for fusion research. It is planned to strengthen the investigations on the use of isotope methods in the hydrogeology of low-permeability structures in support of the work on the storage of nuclear waste in geological formations.

22. In the Agency's Laboratory it is planned to phase out metrology work with the exception of necessary services to the various sections of the Laboratory. The recent move of certain sections to new and more modern premises should result in increased efficiency and improved product output.

23. The present and future programme of the International Laboratory of Marine Radioactivity was the subject of a review in November 1979 by a group of senior experts from France, Japan, the United States and Yugoslavia. In general, the experts considered the present programme of the Laboratory to be successful and recommended that it be continued, with major emphasis on radioactive pollutants but using available resources also in studies of non-nuclear pollutants. In accordance with the recommendations, it is planned to expand the work in marine geochemistry in order to deal with pollutant processes taking place at the sediment-water interface. Studies concerning the mechanisms involved in the transfer of radionuclides through the marine environment to man will continue to be oriented towards providing the basic scientific information needed for the Agency to fulfil its responsibilities under the relevant international conventions protecting the marine environment. Co-ordination of this work between the International Laboratory of Marine Radioactivity and the Nuclear Fuel Cycle Division and the Division of Nuclear Safety will be strengthened. The present agreement between the Agency, the Government of Monaco and the Oceanographic Institute at Monaco expires on 31 December 1980. It has been felt for some time that the facilities which the Laboratory has at its disposal under this agreement were becoming incompatible with the expanding scope of its work and the increasing standards required in the type of research conducted. It is expected that the agreement will be extended for a period of two years only; this should enable all parties to consult on possible definitive solutions which would ensure satisfactory conditions for the Laboratory's future work.

24. Under the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA), covering the Far East and South East Asia and the Pacific and now in its second five-year term, nine projects are in progress or are planned; they cover food and agriculture, health-related environmental research, water resources management, industrial applications, materials science and nuclear instrument maintenance. The objectives and operation of the RCA are in line with the increased emphasis the United Nations is giving to technical co-operation between developing countries (TCDC), and in this respect the RCA may have set a pattern for co-operation among Member States in other regions of the world. A new Regional Industrial Project on the commercial use of isotopes and radiation technology was proposed to UNDP in March 1979. As a result, agreement has now been reached between the Agency and UNDP to initiate a 12-month Preparatory Assistance Project leading to a large-scale industrial demonstration effort. The Project will provide for consultants, fellowships, study tours and administrative support.

25. The dominant factors in the development of the "Safeguards" programme during the period 1981–86 are expected to be an increase in technical and operational effectiveness, improvements in management practices and the rationalization and standardization of procedures – all broadly within the framework of present basic policy and technical concepts. This period is seen as one of consolidation and improvement, in contrast to the fast growth and the establishment of policy which could be said to have characterized the period 1974–1980.

26. However, in certain problem areas it will be necessary to adopt new approaches and eventually to modify existing policy. One question which needs reconsideration is the precise manner in which large plants, particularly reprocessing and enrichment facilities, will be safeguarded. Another is the installation and use of the new generation of safeguards equipment now under development. A third is the organization, manning and operation of field offices.

27. Under the "Information and Technical Services" programme, the basic trends will be towards expanded and improved services to users in Member States and the Secretariat. In the "INIS" sub-programme greater emphasis will be placed on system output. For example, the successful Direct Access Project will be expanded to provide on-line services to additional Member States and the access software will be improved to make it easier for on-line users to conduct their searches. The data base itself will be improved as data flagging techniques and procedures become better defined and more consistently applied by Member States. The annual Input Training Seminar will be supplemented by regional training covering not only input preparation but also the use of output products. In the Library, which serves all organizations at the Vienna International Centre on a cost-sharing basis, the collection will be expanded to meet the requirements of the additional users. The on-line data base for the Library's holdings will be improved and will continue to grow. With regard to computer services, there will be a trend towards less centralized processing through the installation of multi-purpose terminals for data entry, local editing and job execution. The Computer Section provides a service to the entire Vienna International Centre on a cost-reimbursable basis and it is anticipated that the number of non-IAEA users will grow. There will be a trend towards an increased use of word processing equipment. The journal Atomic Energy Review will be discontinued at the end of 1980 since the type of information published in it can now be made available through channels not involving cost to the Agency; Nuclear Fusion will continue and consideration will be given to the possibility of separating it into two series, one covering theoretical and experimental work and the other fusion technology and engineering.

28. The above review of trends under the Agency's technical programmes has shown how it is planned, for the period 1981–82, to phase out certain activities and to expand work in other areas. Changes are also planned in the Agency's programme of scientific meetings. In view of the fact that regional organizations and nuclear societies are becoming increasingly active in arranging international conferences, there is less need in some areas for the Agency to serve as forum for the exchange of information. Consequently, it is planned to keep the annual number of Agency conferences and symposia at the present reduced level of 8–9 (compared to about 12 in previous years). As far as the content of these meetings is concerned, a more restrictive approach will be taken towards accepting papers for presentation and subsequent publication in the proceedings. Moreover, discussions will in general no longer be published. These changes should contribute to a reduction in the cost of all technical programmes.

29. A very thorough review has been made of all proposed Technical Committee and Advisory Group meetings for 1981–82, the main criterion being the value of the product expected from the meeting. Reductions in the scope of technical programmes and in the number of scientific meetings have helped to achieve zero real growth in the draft budget for 1981.

Adjustments made in the budget estimates and manning table for 1980

30. Since the time when the Agency's budget for 1980 was approved, the on-going survey of the utilization of staff has resulted in a number of internal transfers of posts so as to obtain the maximum benefit from available resources.

These changes represent shifts between programmes resulting from the continuing efforts to meet new manpower needs by the redeployment of existing staff. The proposed changes in the manning table are reflected in Annex IV, Table 5. The transfers of posts and of the related costs between programmes are within the manning table and the budget estimates approved for 1980. In addition, the reorganization of the Department of Technical Operations (effective 1 January 1981) is taken into account by shifting the funds and staff of the respective sub-programmes in the adjusted budget and adjusted manning table for 1980, in order to create a comparable basis for price and programme changes in 1981.

31. The initial programme cost estimates for 1980 were based on an exchange rate of 15.05 Austrian schillings to the United States dollar. In the light of the substantial fall in the dollar-schilling exchange rate, the General Conference appropriated $9 067 000 under appropriation Section 10 of the Regular Budget – Adjustment of programme cost estimates – in order to compensate for an estimated average exchange rate of 12.90 schillings to the dollar in 1980. The $9 067 000 has been allocated so as to show the impact on the various programmes, it being assumed that the average exchange rate in 1980 will prove to be 12.90 schillings to the dollar.

## The Regular Budget for 1981

32. The total of the Regular Budget estimates for 1981 as shown in the Consolidated Budget, Table 1, is $88 677 000, an increase of $8 034 000 or 10% over the 1980 level. The Regular Budget by programme is shown in Table 2 and the Regular Budget by item of expenditure is shown in Table 3.

33. The budget estimates are based on an exchange rate of 12.90 Austrian schillings to the United States dollar; they can, therefore, be compared directly with the adjusted budget estimates for 1980, which are also based on that rate. Because recent experience indicates greater stability of the dollar, no appropriation Section is provided, as was done in 1980, to cover an adjustment of programme cost estimates.

34. Table 2 shows the budget estimates for the Agency programmes and for the cost of work for others. The programme cost estimates for 1981 are directly comparable with the adjusted programme cost estimates for 1980. The increase for the Agency programmes in 1981 over the 1980 level is $6 936 000 or 8.8%. The 8.8% increase is entirely accounted for by price increases attributable to inflation. There is zero real growth (actually a $24 000 reduction) for the Agency's programmes as a whole. As regards individual activities, there is a programme increase of 2.2% for "Technical Assistance and Training", a 6.4% programme increase for "Nuclear Safety" and a 5.9% programme increase for "Safeguards". The total programme increase for these activities is more than offset by programme reductions for all of the other Agency programmes.

35. Table 3 shows the Regular Budget by items of expenditure. The price increase for the Agency programmes, as noted above, is 8.8%. As regards individual items of expenditure, programme increases are requested for established posts, common staff costs and travel. The programme increase for established posts and common staff costs is 1.5%, which results from the 33 new posts requested for 1981. The programme increase for travel is 12% and is attributable entirely to the "Nuclear Safety" programme and the "Safeguards" programme. All other items of expenditure show a reduction and, in total, more than offset the increase requested for new staff and travel.

36. It is proposed that the Regular Budget estimates for 1981 of $88 677 000 be funded by estimated income of $7 008 000 plus an assessment on Member States of $81 669 000. The assessment for 1981 is an increase over the assessment for 1980 of $6 749 000 or 9%. The increase is a net figure that results from a 9.3% price increase due to inflation offset by a 0.3% reduction in programme activities.

37. As in the previous budget document, information is provided on the total extrabudgetary resources expected to be available to the Agency for carrying out its programme in 1981 (see Tables 1 and 5).

38. The dollar amounts for extrabudgetary resources are tentative and represent the best estimates that can be made at present. Some amounts represent requests made by the Agency and some are reasonable expectations based on past experience; several are still subject to confirmation.

Target for voluntary contributions to the Technical Assistance Fund

39. The provision of technical assistance by the Agency to its developing Member States is financed from the Technical Assistance Fund, which receives its income mainly in the form of voluntary contributions for which a target is set each year.

40. In June the Board considered the target for voluntary contributions to the Technical Assistance Fund and decided to recommend an increase in the target from $10.5 million for 1980 to $13 million for 1981.

Working Capital Fund

41. The Board recommends that for 1981 the Agency's Working Capital Fund remain at the same level as for 1980, namely $2 million. The recommendation is reflected in draft resolution C set forth in Annex VI. This level will be adequate to maintain the cash liquidity of the Agency only if Members pay their assessments promptly.

Report on the budget to the General Assembly of the United Nations

42. In accordance with Article XVI of the Agency's relationship agreement with the United Nations [2], the budget will be reviewed by ACABQ, which will report on the administrative aspects thereof to the General Assembly of the United Nations.

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[2] INFCIRC/11, Part I.

# THE CONSOLIDATED BUDGET – 1981

## Table 1

| Programme | Regular Budget | Technical Assistance Fund | Extrabudgetary Resources (excluding contributions in kind)[a] | | | | | | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Australia | Belgium | Canada | Germany, F.R. | Italy | Monaco | Sweden | USA | USSR | Other | UN organizations | Sub-total | |
| A. Technical assistance and training | 4 021 000 | 13 650 000 | – | 70 000 | – | 115 000 | – | – | 900 000 | 1 200 000 | 25 000 | – | 6 500 000 | 8 810 000 | 26 481 000 |
| B. Nuclear power | 2 635 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 635 000 |
| C. Nuclear fuel cycle | 2 917 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 917 000 |
| D. Nuclear safety | 4 797 000 | – | – | – | – | – | – | – | – | – | – | – | 12 000 | 12 000 | 4 809 000 |
| E. Nuclear explosions for peaceful purposes | 174 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 174 000 |
| F. Food and agriculture | 4 019 000 | – | – | – | – | 90 000 | – | – | 345 000 | 80 000 | – | – | – | 515 000 | 4 534 000 |
| G. Life sciences | 2 959 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 959 000 |
| H. Physical sciences | 6 301 000 | – | 90 000 | – | – | 60 000 | – | – | – | – | – | 25 000 [b] | – | 175 000 | 6 476 000 |
| J. International Centre for Theoretical Physics | 966 000 | – | – | – | – | – | 700 000 | – | 71 000 | 100 000 | – | 13 000 [c] | 400 000 | 1 284 000 | 2 250 000 |
| K. International Laboratory of Marine Radioactivity | 971 000 | – | – | – | – | – | – | 120 000 | – | – | – | – | 143 000 | 263 000 | 1 234 000 |
| L. Safeguards | 25 003 000 | – | – | – | 185 000 | 200 000 | – | – | – | 1 000 000 | – | – | – | 1 385 000 | 26 388 000 |
| M. Information and technical services | 4 705 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 4 705 000 |
| N. Policy-making organs | 2 683 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 2 683 000 |
| O. Executive management and technical programme planning | 1 677 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 1 677 000 |
| P. Administration | 8 433 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 8 433 000 |
| Q. General services | 13 353 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 13 353 000 |
| S. Cost of work for others | 3 063 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 063 000 |
| TOTAL | 88 677 000 | 13 650 000 | 90 000 | 70 000 | 185 000 | 465 000 | 700 000 | 120 000 | 1 316 000 | 2 380 000 | 25 000 | 38 000 | 7 055 000 | 12 444 000 | 114 771 000 |
| Source of funds: | | | | | | | | | | | | | | | |
| Assessment on Member States | 81 669 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 81 669 000 |
| Voluntary contributions | – | 13 000 000 | – | – | – | – | – | – | – | – | – | – | – | – | 13 000 000 |
| Extrabudgetary resources | – | – | 90 000 | 70 000 | 185 000 | 465 000 | 700 000 | 120 000 | 1 316 000 | 2 380 000 | 25 000 | 38 000 | 7 055 000 | 12 444 000 | 12 444 000 |
| Income from work for others | 3 063 000 | – | – | – | – | – | – | – | – | – | – | – | – | – | 3 063 000 |
| Other miscellaneous income | 3 945 000 | 650 000 | – | – | – | – | – | – | – | – | – | – | – | – | 4 595 000 |
| TOTAL | 88 677 000 | 13 650 000 | 90 000 | 70 000 | 185 000 | 465 000 | 700 000 | 120 000 | 1 316 000 | 2 380 000 | 25 000 | 38 000 | 7 055 000 | 12 444 000 | 114 771 000 |

[a] In addition to the above indicated cash resources, Member States make contributions in kind, consisting of cost-free experts and consultants, stipends for fellowships, training courses and other.

[b] Japan.

[c] Denmark.

# THE REGULAR BUDGET

## By programme

Table 2

| | 1980 Adjusted budget | Price increase | | Programme increase | | Total change | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|---|---|
| | $ | $ | % | $ | % | $ | % | $ | $ | $ |
| A. Technical assistance and training (Regular Budget) | 3 619 000 | 323 700 | 8.9 | 78 300 | 2.2 | 402 000 | 11.1 | 4 021 000 | 4 423 000 | 4 712 000 |
| B. Nuclear Power | 2 792 000 | 174 400 | 6.2 | (331 400) | (11.9) | (157 000) | (5.6) | 2 635 000 | 2 951 000 | 3 158 000 |
| C. Nuclear Fuel Cycle | 2 741 000 | 226 000 | 8.2 | (50 000) | (1.8) | 176 000 | 6.4 | 2 917 000 | 3 314 000 | 3 429 000 |
| D. Nuclear Safety | 4 147 000 | 384 300 | 9.3 | 265 700 | 6.4 | 650 000 | 15.7 | 4 797 000 | 4 969 000 | 5 256 000 |
| E. Nuclear explosions for peaceful purposes | 223 000 | 17 500 | 7.8 | (66 500) | (29.8) | (49 000) | (22.0) | 174 000 | 219 000 | 237 000 |
| F. Food and agriculture | 3 865 000 | 317 600 | 8.2 | (163 600) | (4.2) | 154 000 | 4.0 | 4 019 000 | 4 512 000 | 4 887 000 |
| G. Life sciences | 2 972 000 | 248 800 | 8.4 | (261 800) | (8.8) | (13 000) | (0.4) | 2 959 000 | 3 053 000 | 3 325 000 |
| H. Physical sciences | 6 096 000 | 501 600 | 8.2 | (296 600) | (4.8) | 205 000 | 3.4 | 6 301 000 | 7 061 000 | 7 814 000 |
| J. International Centre for Theoretical Physics (Regular Budget) | 901 000 | 65 000 | 7.2 | – | – | 65 000 | 7.2 | 966 000 | 1 030 000 | 1 097 000 |
| K. International Laboratory of Marine Radioactivity (Regular Budget) | 915 000 | 56 700 | 6.2 | (700) | (0.1) | 56 000 | 6.1 | 971 000 | 1 080 000 | 1 126 000 |
| L. Safeguards | 21 740 000 | 1 989 000 | 9.1 | 1 274 000 | 5.9 | 3 263 000 | 15.0 | 25 003 000 | 28 950 000 | 31 586 000 |
| M. Information and technical services | 4 436 000 | 365 000 | 8.2 | (96 000) | (2.1) | 269 000 | 6.1 | 4 705 000 | 5 108 000 | 5 547 000 |
| N. Policy-making organs | 2 592 000 | 206 800 | 8.0 | (115 800) | (4.5) | 91 000 | 3.5 | 2 683 000 | 2 754 000 | 2 859 000 |
| O. Executive management and technical programme planning | 1 568 000 | 146 000 | 9.3 | (37 000) | (2.3) | 109 000 | 7.0 | 1 677 000 | 1 783 000 | 1 886 000 |
| P. Administration | 7 855 000 | 623 600 | 7.9 | (45 600) | (0.6) | 578 000 | 7.3 | 8 433 000 | 10 103 000 | 11 101 000 |
| Q. General services | 12 216 000 | 1 314 000 | 10.7 | (177 000) | (1.4) | 1 137 000 | 9.3 | 13 353 000 | 14 508 000 | 15 745 000 |
| Agency programmes | 78 678 000 | 6 960 000 | 8.8 | (24 000) | (0.0) | 6 936 000 | 8.8 | 85 614 000 | 95 818 000 | 103 765 000 |
| S. Cost of work for others | 1 965 000 | 133 000 | 6.8 | 965 000 | 49.1 | 1 098 000 | 55.9 | 3 063 000 | 3 240 000 | 3 440 000 |
| TOTAL: Regular Budget | 80 643 000 | 7 093 000 | 8.8 | 941 000 | 1.2 | 8 034 000 | 10.0 | 88 677 000 | 99 058 000 | 107 205 000 |
| Regular Budget | 80 643 000 | 7 093 000 | 8.8 | 941 000 | 1.2 | 8 034 000 | 10.0 | 88 677 000 | 99 058 000 | 107 205 000 |
| Less: Miscellaneous income | | | | | | | | | | |
| Income from work for others | 1 965 000 | 133 000 | 6.8 | 965 000 | 49.1 | 1 098 000 | 55.9 | 3 063 000 | 3 240 000 | 3 440 000 |
| Other | 3 258 000 | – | | 687 000 | 21.1 | 687 000 | 21.1 | 3 945 000 | 4 055 000 | 4 130 000 |
| Cash surplus | 500 000 | – | | (500 000) | (100.0) | (500 000) | (100.0) | – | | |
| Assessment on Member States | 74 920 000 | 6 960 000 | 9.3 | (211 000) | (0.3) | 6 749 000 | 9.0 | 81 669 000 | 91 763 000 | 99 635 000 |

# THE REGULAR BUDGET

## By item of expenditure

Table 3

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Price | % | Programme | % | Total | % | | | |
| Salaries and wages | | | | | | | | | | | |
| Established posts | 33 556 786 | 41 142 000 | 3 166 000 | 7.7 | 599 000 | 1.5 | 3 765 000 | 9.2 | 44 907 000 | 48 783 000 | 52 560 000 |
| Consultants | 600 563 | 763 300 | 78 200 | 10.3 | (78 900) | (10.3) | (700) | (0.0) | 762 600 | 1 405 000 | 1 757 000 |
| Overtime | 164 680 | 182 800 | 10 700 | 5.9 | (14 900) | (8.2) | (4 200) | (2.3) | 178 600 | 219 900 | 223 400 |
| Temporary assistance | 739 932 | 514 500 | 31 700 | 6.1 | (2 800) | (0.5) | 28 900 | 5.6 | 543 400 | 577 100 | 568 700 |
| Sub-total | 35 061 961 | 42 602 600 | 3 286 600 | 7.7 | 502 400 | 1.2 | 3 789 000 | 8.9 | 46 391 600 | 50 985 000 | 55 109 100 |
| Common staff costs | 10 237 377 | 11 930 900 | 1 583 400 | 13.3 | 185 000 | 1.5 | 1 768 400 | 14.8 | 13 699 300 | 15 123 500 | 16 292 100 |
| Travel | 1 481 079 | 1 913 400 | 282 300 | 14.8 | 230 700 | 12.0 | 513 000 | 26.8 | 2 426 400 | 2 979 000 | 3 449 000 |
| Meetings | | | | | | | | | | | |
| Conferences, symposia, seminars | 475 867 | 597 000 | 78 000 | 13.1 | (42 000) | (7.0) | 36 000 | 6,1 | 633 000 | 752 000 | 1 050 000 |
| Technical committees, advisory groups | 1 108 742 | 1 373 000 | 190 000 | 13.8 | (2 000) | (0.1) | 188 000 | 13.7 | 1 561 000 | 1 771 000 | 1 884 000 |
| Representation and hospitality | 87 767 | 105 600 | 3 600 | 3.4 | (1 000) | (0.9) | 2 600 | 2.5 | 108 200 | 136 100 | 149 300 |
| Scientific and technical contracts | 1 975 198 | 2 345 500 | 174 500 | 7.4 | (116 000) | (4.9) | 58 500 | 2.5 | 2 404 000 | 3 370 000 | 3 511 000 |
| Scientific supplies and equipment | 975 525 | 1 504 200 | 150 200 | 10.0 | (6 600) | (0.5) | 143 600 | 9.5 | 1 647 800 | 2 403 500 | 2 475 000 |
| Common services, supplies and equipment | 10 423 179 | 15 423 800 | 1 153 200 | 7.4 | (729 600) | (4.7) | 423 600 | 2.7 | 15 847 400 | 17 300 600 | 18 766 500 |
| Other items of expenditure | 723 383 | 882 000 | 58 200 | 6.6 | (44 900) | (5.1) | 13 300 | 1 5 | 895 300 | 997 300 | 1 079 000 |
| Agency programmes | 62 550 078 | 78 678 000 | 6 960 000 | 8.8 | (24 000) | (0.0) | 6 936 000 | 8.8 | 85 614 000 | 95 818 000 | 103 765 000 |
| Cost of work for others | – | 1 965 000 | 133 000 | 6.8 | 965 000 | 49.1 | 1 098 000 | 55.9 | 3 063 000 | 3 240 000 | 3 440 000 |
| Total Regular Budget | 62 550 078 | 80 643 000 | 7 093 000 | 8.8 | 941 000 | 1.2 | 8 034 000 | 10.0 | 88 677 000 | 99 058 000 | 107 205 000 |

## Summary of income

Table 4

| Item | 1979 Actual | 1980 Adjusted budget | Increase or (decrease) over 1980 | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|
| Assessed contributions on Member States | 58 544 519 | 74 920 000 | 6 749 000 | 81 669 000 | 91 763 000 | 99 635 000 |
| Cash surplus in respect of 1978 | – | 500 000 | (500 000) | – | – | – |
| Miscellaneous income | | | | | | |
| (a) Income from work for others | | | | | | |
| Data processing services | 646 808 | 719 000 | 60 000 | 779 000 | 825 000 | 876 000 |
| Printing services | 322 475 | 341 000 | 871 000 | 1 212 000 | 1 271 000 | 1 334 000 |
| Medical services | 181 347 | 287 000 | 35 000 | 322 000 | 348 000 | 379 000 |
| Library services | 93 612 | 618 000 | 132 000 | 750 000 | 796 000 | 851 000 |
| Sub-total | 1 244 242 | 1 965 000 | 1 098 000 | 3 063 000 | 3 240 000 | 3 440 000 |
| (b) Attributable to specific programmes | | | | | | |
| Publications of the Agency | 696 063 | 643 000 | 57 000 | 700 000 | 710 000 | 720 000 |
| INIS publications including microfiches | 292 323 | 315 000 | 25 000 | 340 000 | 350 000 | 360 000 |
| CINDA publications | 26 538 | 30 000 | (10 000) | 20 000 | 15 000 | 25 000 |
| Advertising | 15 429 | 30 000 | (10 000) | 20 000 | 20 000 | 20 000 |
| Laboratory income | 48 829 | 100 000 | – | 100 000 | 100 000 | 100 000 |
| Sales of surplus property | 25 624 | 20 000 | – | 20 000 | 20 000 | 20 000 |
| Amounts recoverable under safeguards agreements from non-member States | 82 557 | 90 000 | 20 000 | 110 000 | 120 000 | 130 000 |
| UNDP programme support cost | 949 400 | 860 000 | 90 000 | 950 000 | 980 000 | 1 000 000 |
| SIDA programme support cost | 78 192 | 50 000 | 50 000 | 100 000 | 100 000 | 50 000 |
| Sub-total | 2 214 955 | 2 138 000 | 222 000 | 2 360 000 | 2 415 000 | 2 425 000 |
| (c) Not attributable to specific programmes | | | | | | |
| Investment and interest income | 1 673 433 | 810 000 | 250 000 | 1 060 000 | 1 100 000 | 1 150 000 |
| Refund from the United Nations Joint Staff Pension Fund | 184 870 | 80 000 | 105 000 | 185 000 | 190 000 | 195 000 |
| Refund of Value Added Tax | 793 445 | – | – | – | – | – |
| Other: Gain on exchange | 311 221 | – | – | – | – | – |
| Other | 367 802 | 230 000 | 110 000 | 340 000 | 350 000 | 360 000 |
| Sub-total | 3 330 771 | 1 120 000 | 465 000 | 1 585 000 | 1 640 000 | 1 705 000 |
| Total miscellaneous income | 6 789 968 | 5 223 000 | 1 785 000 | 7 008 000 | 7 295 000 | 7 570 000 |
| TOTAL | 65 334 487 | 80 643 000 | 8 034 000 | 88 677 000 | 99 058 000 | 107 205 000 |

## EXTRABUDGETARY RESOURCES 1979–1981
(excluding contributions in kind)[a]

Table 5

| | | 1979 Actual obligations | 1980 Estimate | 1981 Estimate |
|---|---|---|---|---|
| A. | Technical assistance and training | | | |
| | UNDP | 6 065 716 | 6 000 000 | 6 500 000 |
| | Argentina | 18 028 | 2 000 | – |
| | Australia | 40 325 | 25 000 | – |
| | Belgium | 62 470 | 69 000 | 70 000 |
| | Canada | 24 115 | 81 000 | – |
| | Denmark | – | 60 000 | – |
| | Federal Republic of Germany | 259 532 | 244 000 | 115 000 |
| | Japan | 12 340 | 4 000 | – |
| | Sweden | 1 602 810 | 1 050 000 | 900 000 |
| | Union of Soviet Socialist Republics | 14 858 | 25 000 | 25 000 |
| | United States of America | 1 210 072 | 1 200 000 | 1 200 000 |
| | Sub-total | 9 310 266 | 8 760 000 | 8 810 000 |
| B. | Nuclear power | | | |
| | INFCE | 645 614 | 273 000 | – |
| | NEA/OECD | 22 680 | 43 000 | – |
| | United States of America | 157 205 | 86 000 | – |
| | Sub-total | 825 499 | 402 000 | – |
| D. | Nuclear safety | | | |
| | UNEP | 20 159 | 12 000 | 12 000 |
| | Supplementary safety programme | 32 272 | 175 000 | – |
| | United States of America | 55 765 | 20 000 | – |
| | Sub-total | 108 196 | 207 000 | 12 000 |
| F. | Food and agriculture | | | |
| | Federal Republic of Germany | 236 471 | 365 000 | 90 000 |
| | Japan (RCA) | – | 76 000 | – |
| | Sweden | 244 493 | 336 000 | 345 000 |
| | United States of America | 86 359 | 32 000 | 80 000 |
| | Sub-total | 567 323 | 809 000 | 515 000 |
| G. | Life sciences | | | |
| | United States of America | 8 236 | 17 000 | – |

| | | | | |
|---|---|---|---|---|
| H. | Physical sciences | | | |
| | Australia (RCA) | 69 334 | 89 000 | 90 000 |
| | Federal Republic of Germany | 153 554 | 50 000 | 60 000 |
| | Japan (RCA) | 21 164 | 25 000 | 25 000 |
| | United States of America | 8 721 | 141 000 | – |
| | Sub-total | 252 773 | 305 000 | 175 000 |
| J. | International Centre for Theoretical Physics | | | |
| | United Nations University | – | 30 000 | – |
| | UNESCO | 319 000 | 320 000 | 400 000 |
| | UNEP | – | 28 000 | – |
| | Denmark | – | 13 000 | 13 000 |
| | Federal Republic of Germany | – | 28 000 | – |
| | Italy | 758 301 | 700 000 | 700 000 |
| | Japan | – | 24 000 | – |
| | Libyan Arab Jamahiriya | 101 081 | – | – |
| | Sweden | 68 182 | 71 000 | 71 000 |
| | United States of America | – | 100 000 | 100 000 |
| | Sub-total | 1 246 564 | 1 314 000 | 1 284 000 |
| K. | International Laboratory of Marine Radioactivity | | | |
| | UNEP | 196 413 | 135 000 | 135 000 |
| | UNESCO | 8 500 | 8 000 | 8 000 |
| | Monaco | 100 216 | 110 000 | 120 000 |
| | Sub-total | 305 129 | 253 000 | 263 000 |
| L. | Safeguards | | | |
| | Australia | 62 887 | 80 000 | – |
| | Canada | 114 925 | 160 000 | 185 000 |
| | Federal Republic of Germany | 118 435 | 200 000 | 200 000 |
| | Union of Soviet Socialist Republics | 55 180 | 250 000 | – |
| | United States of America | 918 244 | 800 000 | 1 000 000 |
| | Sub-total | 1 269 671 | 1 490 000 | 1 385 000 |
| P. | Administration | | | |
| | Netherlands | 325 | 77 000 | – |
| | Sweden | – | 95 000 | – |
| | United Kingdom of Great Britain and Northern Ireland | 35 273 | 45 000 | – |
| | United States of America | 55 372 | 55 000 | – |
| | Sub-total | 90 970 | 272 000 | – |
| TOTAL | | 13 984 627 | 13 829 000 | 12 444 000 |

[a] In addition to the above indicated cash resources, Member States make contributions in kind consisting of cost-free experts and consultants, stipends for fellowships, training courses and other.

# THE PROGRAMME BUDGET

## A. TECHNICAL ASSISTANCE AND TRAINING

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table A.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 951 060 | 2 307 000 | 188 000 | 13 000 | 201 000 | 2 508 000 | 2 748 000 | 2 938 000 |
| Consultants | 7 295 | 49 600 | 2 400 | (33 000) | (30 600) | 19 000 | 19 000 | 21 000 |
| Overtime | 2 571 | 2 900 | 100 | – | 100 | 3 000 | 3 000 | 3 000 |
| Temporary assistance | 47 124 | 33 800 | 2 200 | – | 2 200 | 36 000 | 52 000 | 54 000 |
| Sub-total | 2 008 050 | 2 393 300 | 192 700 | (20 000) | 172 700 | 2 566 000 | 2 822 000 | 3 016 000 |
| Common staff costs | 595 037 | 669 400 | 91 700 | 4 000 | 95 700 | 765 100 | 851 400 | 910 700 |
| Travel | 31 892 | 90 200 | 12 800 | (8 000) | 4 800 | 95 000 | 98 000 | 103 000 |
| Representation and hospitality | 374 | 1 000 | 100 | – | 100 | 1 100 | 1 300 | 1 300 |
| Common services, supplies and equipment | – | 8 100 | 400 | 1 300 | 1 700 | 9 800 | 10 300 | 11 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 291 896 | 261 000 | 14 000 | 100 000 | 114 000 | 375 000 | 400 000 | 420 000 |
| Printing and publishing services | 94 687 | 126 000 | 14 000 | 4 000 | 18 000 | 144 000 | 160 000 | 180 000 |
| Data processing services | 36 361 | 70 000 | (2 000) | (3 000) | (5 000) | 65 000 | 80 000 | 70 000 |
| TOTAL | 3 058 297 | 3 619 000 | 323 700 | 78 300 | 402 000 | 4 021 000 | 4 423 000 | 4 712 000 |

## SUMMARY OF MANPOWER

Table A.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 8 | 9 | 9 | – | 9 | 9 | 9 |
| P-4 | 11 | 11 | 11 | – | 11 | 11 | 11 |
| P-3 | 8 | 8 | 8 | – | 8 | 8 | 9 |
| P-2 | 3 | 4 | 4 | – | 4 | 5 | 5 |
| Sub-total | 31 | 33 | 33 | – | 33 | 34 | 35 |
| GS | 41 | 41 | 41 | 1 | 42 | 45 | 47 |
| TOTAL | 72 | 74 | 74 | 1 | 75 | 79 | 82 |

## CHANGES IN COSTS AND MANPOWER

### Costs

A/1. As will be seen from Table A.1 above, the cost of this programme under the Regular Budget is expected to increase by $402 000, of which $323 700 will be required to cover salary and other price increases and $78 300 will be a programme increase.

A/2. A programme increase of $17 000 is foreseen in respect of salaries and common staff costs due to the addition of one GS post for the Fellowships and Training Section. As indicated by actual requirements in the past, additional funds will be needed for linguistic services; a programme increase of $100 000 is foreseen under this item. Programme reductions will be possible in respect of consultants' services ($33 000) and travel ($8 000). The increase of $4 000 under printing and publishing services is offset by a decrease of $3 000 under data processing services. The programme increase of $1 300 in respect of common services is related to allocation of the cost of long-distance telephone calls.

A/3. The Agency's administrative costs in carrying out UNDP projects are in part refunded to the Agency as miscellaneous income under the Regular Budget. The UNDP programme support costs shown in Table 4 (Summary of income) are related to the support both under the "Technical Assistance and Training" programme and under "Executive Management and Technical Programme Planning" and "Administration".

A/4. An amount of $13 650 000 is foreseen for the Technical Assistance Fund, as compared with $11 050 000 in the budget for 1980. The increase of $2.6 million is attributable to an increase in the target for voluntary contributions from $10.5 million to $13 million and to an increase of $100 000 in other income.

A/5. As can be seen from Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–1981), it is expected that UNDP will put $6.5 million at the Agency's disposal, and it is hoped that $900 000 will be made available by Sweden for technical assistance. An amount of $25 000 is foreseen for special fellowships to be financed from funds contributed for that purpose by the Soviet Union. Special contributions to finance technical assistance have also been offered by Belgium ($70 000), the Federal Republic of Germany ($115 000) and the United States ($1.2 million).

### Manpower

A/6. As will be seen from Table A.2 above, the addition of one GS post is planned for 1981. A detailed justification is provided in Annex IV.

A/7. For 1982, the addition of one P-2 post (for the Europe and Middle East Section) and of three GS posts (for the Asia and Pacific Section, the Training Courses Section and the Experts Section) is foreseen. It is also anticipated that in 1983 one additional P-3 post and two additional GS posts will be needed.

## THE PROGRAMME

### OBJECTIVE

A/8. The objective is to promote the transfer to developing countries of skills and knowledge relating to the use of nuclear energy for peaceful purposes in order to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world, in accordance with the Agency's Statute.

A/9. The mechanisms for achieving this objective are:

(a) The annual regular programme of technical assistance approved by the Board of Governors and financed from the Agency's own resources (derived mainly from voluntary contributions, a target for which is set annually by the General Conference) and through additional, extrabudgetary contributions in cash and in kind;
(b) The designation of the Agency as executing agency for UNDP-assisted projects;
(c) Special arrangements with donor countries for providing assistance to specific projects financed entirely by those countries; and
(d) Funds-in-trust arrangements with recipient countries for the provision of assistance through the Agency.

### RESULTS TO DATE

A/10. Through the technical assistance provided and administered by the Agency, recipient States have been able to introduce nuclear technology in a wide variety of fields, ranging from basic to advanced applications. A summary and an analysis of the results achieved are to be found in the annual reports on the provision of technical assistance by the Agency submitted to the Board and subsequently communicated to the General Conference.

A/11. New programming techniques, such as the introduction of multi-year projects and the indication of the different kinds of currency involved in individual projects under the annual regular programmes, have led to better management and utilization of resources.

A/12. By the end of 1979 a computer-based system for the administration of technical assistance activities had been designed; it will be introduced gradually starting this year. The system will provide directer links with the data generated by the Division of Budget and Finance, facilitate monitoring of the technical assistance programme and produce up-to-date information for management and statistical purposes.

A/13. A new time-table for the submission of technical assistance requests has been adopted (see paragraph 17 of the Revised Guiding Principles and General Operating Rules to Govern the Provision of Technical Assistance by the Agency – INFCIRC/267), and this should facilitate contacts with the authorities of recipient countries through correspondence, through consultations during sessions of the General Conference and, when necessary, through programming missions.

### PLANS FOR 1981–82

A/14. Efforts to assist, through programming missions, requesting countries in the identification and preparation of long-term integrated projects will continue.

A/15. It is expected that the expansion of nuclear power programmes in developing countries will continue and that this will result in an increased demand for Agency assistance in the training of nuclear power project personnel, especially in connection with nuclear safety.

A/16. The Agency will continue to explore with UNDP ways and means of achieving greater technical co-operation among developing countries (TCDC). The establishment of regional UNDP projects may prove useful in this connection.

### RELATED ACTIVITIES

A/17. Technical support for the Agency's technical assistance programme is provided by units within the Department of Research and Isotopes and the Department of Technical Operations. On the other hand, because

of their specialized knowledge of many countries and their permanent contacts with national authorities und UNDP resident representatives, the four area sections in the Division of Technical Assistance (Africa; Asia and the Pacific; Europe and the Middle East; and Latin America) frequently serve as intermediaries in other Agency activities – for example, the arrangement of symposia and technical panels, the negotiation of research contracts and the preparation of missions by staff members.

## OUTLINE OF CHANGES DURING 1983–86

A/18. It is expected that the technical assistance programme will expand further and that the operational capabilities of the Agency will have to be adapted through increased utilization of modern management tools and manpower increases and redeployment.

A/19. Special attention will be paid to the promotion of regional projects and – within this context – to nuclear power, especially its safety-related aspects.

A/20. As requested in many resolutions of United Nations organs, special attention will be paid to assistance to the "less developed" countries, but it is realized that in some of them the introduction of nuclear techniques would be premature and should be preceded by intensive development in other fields.

A/21 Follow-up assistance will receive attention in cases where programmes started in developing countries some years ago with Agency co-operation require upgrading due to the development of new techniques and equipment in the nuclear field. Once a sound counterpart capability has been developed, it must be maintained at an efficient operational level, and this is not always possible without international support.

## CO-OPERATION WITH OTHER ORGANIZATIONS

A/22. The Agency keeps other organizations within the United Nations system informed about its annual regular programme of technical assistance and co-operates with them in projects (including UNDP projects) whenever common interests are involved.

A/23. Special attention will be paid to co-operation with regional intergovernmental organizations interested in activities in the nuclear field, and efforts will be made to initiate joint regional projects.

A/24. Continuous consultation with UNDP and its resident representatives will be maintained in connection with the execution of large-scale, long-term projects for the transfer of nuclear technology and nuclear raw materials prospecting.

## STRUCTURE

A/25. This programme consists of three sub-programmes, which are dealt with separately below.

# SUB-PROGRAMME A.1

## Experts

## OBJECTIVE

A.1/1. The objective is to provide, through the services of internationally recruited experts, advice on and training for the implementation of technical assistance projects.

RESULTS TO DATE

A.1/2. On average, the Agency made the services of about 300 experts and visiting professors available annually during the period 1976–79; altogether 86 countries benefited from these services. During the same period, over 500 expert reports were issued; most of them are available to Member States on request and are listed in the annual reports on the provision of technical assistance by the Agency.

A.1/3. In 1979 a total of 302 technical assistance experts were in the field, several in connection with two or more projects.

PLANS FOR 1981–86

A.1/4. The expected expansion in technical assistance activities will involve a further increase in the number of expert assignments and in the number of associated administrative actions, in the handling of which the new computer-based system should prove extremely useful. The co-operation of advanced Member States will be needed for the recruitment of experts in "difficult" areas such as reactor fuels and components and nuclear power safety.

## SUB-PROGRAMME A.2

### Equipment

OBJECTIVE

A.2/1. The objective is to purchase and deliver equipment and supplies required for the execution of technical assistance projects (and also for research contracts) and to conduct negotiations and finalize arrangements for the transfer of nuclear fuels and other fissionable materials under project agreements approved by the Board.

RESULTS TO DATE

A.2/2. In support of the Agency's technical assistance programme, equipment and supplies to an average annual value of about $4.5 million were purchased and delivered during the period 1976–79; in addition, equipment orders to an average annual value of about $450 000 were placed in connection with research contracts. More than 1500 purchase orders were processed in 1979 alone.

PLANS FOR 1981–86

A.2/3. It is expected that the need to purchase equipment and supplies and to contract for services will expand further, in line with the growth of the Agency's technical assistance programme, and that the equipment to be purchased will become more complex. Also, the transfer of nuclear fuels and other fissionable materials is expected to increase significantly.

## SUB-PROGRAMME A.3

### Fellowships and training

OBJECTIVE

A.3/1. The objective is to provide appropriate technical and scientific training for personnel from developing countries through a programme of fellowships, scientific visits, study tours and training courses.

## RESULTS TO DATE

A.3/2. On average, about 460 individual fellowships were awarded annually during the period 1976–79; in addition, about 400 engineers, scientists, technicians and government officials a year received training through regional and interregional training courses or study tours organized by the Agency. The total number of such courses and tours during this period was 74. The training courses on nuclear power project planning and implementation and related subjects (started in 1975 and considerably expanded since then) have been particularly successful.

## PLANS FOR 1981–86

A.3/3. The programme of fellowships and scientific visits is expected to continue at about the same level as in past years. The growing demand for specialized on-the-job training in the nuclear power field and for the training of technicians appears to be an important trend.

A.3/4. The Agency is assisting more and more in the establishment of domestic training programmes, especially in countries which have ongoing nuclear power programmes; this should lead to the training of technicians, operators, skilled craftsmen and other non-professional personnel through the medium of their own language.

A.3/5. It is expected that about 25 Agency training courses and study tours will be offered each year. The need for training courses in the nuclear power field will be kept under constant review, and appropriate specialized courses in nuclear power subjects will be offered as needed. Training courses for technicians will also receive increased support.

## CO-OPERATION WITH OTHER ORGANIZATIONS

A.3/6. Co-operation with ILO, UNESCO, WHO and other organizations in the United Nations family and also with organizations such as the Inter-American Nuclear Energy Commission (IANEC) of the Organization of American States will be maintained.

# B. NUCLEAR POWER

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table B.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 446 566 | 1 359 000 | 61 000 | (23 000) | 38 000 | 1 397 000 | 1 487 000 | 1 587 000 |
| Consultants | 83 566 | 64 700 | 8 200 | 3 500 | 11 700 | 76 400 | 101 000 | 104 000 |
| Overtime | 138 | – | – | – | – | – | – | – |
| Temporary assistance | 5 275 | 6 500 | 300 | (400) | (100) | 6 400 | 6 900 | 7 000 |
| Sub-total | 1 535 545 | 1 430 200 | 69 500 | (19 900) | 49 600 | 1 479 800 | 1 594 900 | 1 698 000 |
| Common staff costs | 441 301 | 394 200 | 38 800 | (7 000) | 31 800 | 426 000 | 461 200 | 492 300 |
| Travel | 35 111 | 44 800 | 6 400 | (4 200) | 2 200 | 47 000 | 70 000 | 75 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 113 668 | 36 000 | 5 000 | (9 000) | (4 000) | 32 000 | 63 000 | 74 000 |
| Technical committees, advisory groups | 118 669 | 93 000 | 14 000 | (22 000) | (8 000) | 85 000 | 135 000 | 144 000 |
| Representation and hospitality | 9 701 | 7 100 | 100 | – | 100 | 7 200 | 7 900 | 8 300 |
| Scientific and technical contracts | 118 829 | 73 000 | 6 000 | 9 000 | 15 000 | 88 000 | 95 000 | 95 000 |
| Scientific supplies and equipment | 216 | – | – | – | – | – | 1 000 | 2 000 |
| Common services, supplies and equipment | 3 980 | 8 700 | 200 | 100 | 300 | 9 000 | 12 000 | 12 400 |
| Transfer of costs. | | | | | | | | |
| Linguistic services | 155 905 | 109 000 | 7 000 | (21 000) | (14 000) | 95 000 | 115 000 | 128 000 |
| Printing and publishing services | 369 230 | 390 000 | 32 000 | (159 000) | (127 000) | 263 000 | 256 000 | 280 000 |
| Data processing services | 140 816 | 175 000 | (6 000) | (89 000) | (95 000) | 80 000 | 89 000 | 106 000 |
| To other: PNE | (19 000) | (24 000) | (2 000) | 19 000 | 17 000 | (7 000) | (8 000) | (8 000) |
| Conference services | – | 55 000 | 3 400 | (28 400) | (25 000) | 30 000 | 59 000 | 51 000 |
| TOTAL | 3 023 971 | 2 792 000 | 174 400 | (331 400) | (157 000) | 2 635 000 | 2 951 000 | 3 158 000 |

## SUMMARY OF MANPOWER

Table B.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 11 | 11 | 9 | – | 9 | 9 | 9 |
| P-4 | 14 | 14 | 7 | – | 7 | 7 | 7 |
| P-3 | 4 | 4 | 4 | – | 4 | 4 | 4 |
| P-2 | 2 | 2 | 1 | – | 1 | 1 | 1 |
| Sub-total | 32 | 32 | 22 | – | 22 | 22 | 22 |
| GS | 16 | 17 | 13 | – | 13 | 13 | 13 |
| TOTAL | 48 | 49 | 35 | – | 35 | 35 | 35 |

## CHANGES IN COSTS AND MANPOWER

### Costs

B/1. As will be seen from Table B.1 above, it is expected that the cost of this programme will decrease by $157 000 as a net result of salary and other price increases of $174 400 and a programme decrease of $331 400.

B/2. The programme decrease of $30 000 in respect of salaries and common staff costs is the net result of abolishing a P-2 post under this programme (in the adjusted manning table for 1980 it is transferred to another programme following the annual survey on manpower requirements).

B/3. There will be a programme increase of $3 500 in respect of consultants' services, mainly under the "Nuclear power programme implementation" sub-programme. The programme decrease of $4 200 in respect of duty travel is related to all sub-programmes, while the programme increase of $9 000 in respect of scientific and technical contracts is for the "Energy forecasts and the economic assessment of nuclear power and its fuel cycle" and the "Technology of nuclear power plants of proven types" sub-programmes.

B/4. It is planned to hold one symposium in 1981, compared with one seminar foreseen in the budget for 1980. The programme decrease of $9 000 is related to foreseen interpretation requirements and the intention of having no records officers at future meetings. There will also be a programme decrease of $22 000 in respect of technical committees and advisory groups, the number of which will decrease by one in comparison with the number foreseen in the budget for 1980.

B/5. As regards the allocation of service costs, programme reductions are foreseen in respect of linguistic services ($21 000), printing and publishing services ($159 000), data processing services ($89 000) and conference services ($28 400). There will also be a programme decrease of $19 000 in the charges transferred to the "Nuclear Explosions for Peaceful Purposes" programme for services rendered to that programme.

### Manpower

B/6. Table B.2 reflects, in the "1980 Adjusted" column, the transfer to this programme of one GS post and the transfer from this programme of one P-2 post. A detailed justification for the new post is provided in Annex IV. The "1980 Adjusted" column also reflects the reorganization of the Department of Technical Operations, in the course of which nine Professional posts (two at the P-5 and seven at the P-4 level) and five GS posts are being transferred to the newly established "Nuclear Fuel Cycle" programme.

B/7. No further changes are foreseen for 1981, 1982 and 1983.

## Summary of manpower and costs by sub-programme

Table B.3

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | Man-years | | Costs | Man-years | | Costs |
| | P | GS | | P | GS | | P | GS | |
| Energy forecasts and the economic assessment of nuclear power and its fuel cycle | 7.4 | 4.8 | 800 000 | 7.4 | 4.8 | 858 000 | 7.4 | 4.8 | 926 000 |
| Nuclear power programme implementation | 4.7 | 2.9 | 544 000 | 4.7 | 2.9 | 617 000 | 4.7 | 2.9 | 674 000 |
| Technology of nuclear power plants of proven types | 5.7 | 2.9 | 635 000 | 5.7 | 2.9 | 789 000 | 5.7 | 2.9 | 828 000 |
| Advanced nuclear power technology | 4.2 | 2.4 | 656 000 | 4.2 | 2.4 | 687 000 | 4.2 | 2.4 | 730 000 |
| TOTAL | 22.0 | 13.0 | 2 635 000 | 22.0 | 13.0 | 2 951 000 | 22.0 | 13.0 | 3 158 000 |

## THE PROGRAMME

### OBJECTIVE

B/8. The objective is to promote the exchange of information between Member States on technical aspects of nuclear power plants and economic aspects of nuclear power and its fuel cycle, to provide assistance to Member States in the planning, implementation and operation of nuclear power plants and to assist in the development of advanced nuclear power technology and fuel cycle concepts. This will be done in particular by:
(a) Giving interested Member States technical and economic advice in connection with their programmes and supporting them in ensuring that their nuclear manpower is adequately trained;
(b) Collecting and disseminating evaluated and systematized information on nuclear power requirements and costs, on plant operating experience, on proven and advanced nuclear power technologies and on new fuel cycle concepts; and
(c) Assessing the role of nuclear power, compared to conventional and non-conventional energy options, in meeting world energy demands within financing, environmental, manpower availability and infrastructure constraints.

### STRUCTURE

B/9. This programme consists of four sub-programmes, which are dealt with separately below.

*(see Table B.3)*

## SUB-PROGRAMME B.1

Energy forecasts and the economic assessment of nuclear power and its fuel cycle

### OBJECTIVE

B.1/1. The objective is to ascertain the future economic status and energy supply role of nuclear power, particularly in the energy programmes of the developing regions of the world, and the resulting demands for nuclear fuels and fuel cycle services.

### OUTLINE FOR 1981–86

B.1/2. Studies will be made of the future demands for energy and assistance given in the planning of national energy supply programmes. The economics of nuclear power plants and of the nuclear fuel cycle will be evaluated and projections of the demand for nuclear raw materials and fuel cycle services will be made.

### STRUCTURE

B.1/3. This sub-programme consists of three components, which are described in the following paragraphs.

## Energy forecasts and the economic assessment of nuclear power and its fuel cycle

Summary by programme components

Table B.4

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Energy demand analysis and nuclear power planning | 3.3 | 2.5 | 304 100 | – | 18 000 | 5 900 | 328 000 |
| Economics of nuclear power and its fuel cycle | 3.1 | 1.3 | 264 300 | 6 000 | – | 2 700 | 273 000 |
| Demand for nuclear raw materials and fuel cycle services | 1.0 | 1.0 | 94 100 | 1 000 | – | 1 900 | 97 000 |
| Linguistic services | – | – | – | – | – | 14 000 | 14 000 |
| Printing and publishing services | – | – | – | – | – | 15 000 | 15 000 |
| Data processing services | – | – | – | – | – | 76 000 | 76 000 |
| Conference services | – | – | – | – | – | 4 000 | 4 000 |
| Transfer to other programmes for direct support | – | – | – | – | – | (7 000) | (7 000) |
| TOTAL | 7.4 | 4.8 | 662 500 | 7 000 | 18 000 | 112 500 | 800 000 |

### Energy demand analysis and nuclear power planning (component B.1.1)

#### Objective

B.1.1/1. The objective is:
(a) To provide, in a unified and systematic way, energy and related economic data for long-term energy planning;
(b) To ascertain the role which could be played by nuclear power in supplying the energy needs of the world in general and the developing regions in particular; and
(c) To implement and make available to Member States some of the necessary analytical tools for power system planning.

#### Results to date

B.1.1/2. The energy and economic data bank reached partial operational status at the end of 1979. Energy and economic data required for analysis of the role of nuclear power in Member States, for official Agency reports, or for national, regional or world surveys can now be obtained quickly through computerized procedures. The data bank is currently used as the basis for a number of internal Agency reports on energy resources and usage, national economic parameters and other statistical factors.

B.1.1/3. By the beginning of 1980, the set of computer programs for electric power system expansion planning (based on WASP) had been released to 38 Member States and 5 international organizations. About 75 engineers from 19 developing countries had been trained in the use of these programs, including those who underwent courses on electric system expansion planning held in 1978 and 1979 at Argonne National Laboratory in the United States. A manual on electric system expansion planning methodology will be published this year.

#### Plans for 1981–82

B.1.1/4. The energy and economic data bank will be improved through the development of new retrieval programs, data for later years will be added and the data will be checked against those from other sources. Access to the data bank

will be provided to Member States upon request. At the same time it is intended to use the energy data bank for testing a variety of models for forecasting future energy demand, especially in developing countries. Experience gained in the course of testing will improve the Agency's capability for making energy and nuclear power growth projections.

B.1.1/5. The WASP methodology will be improved to cover the treatment of multinode systems and hydroelectric plants with large reservoirs and to model new electrical energy storage techniques. The results of these improvements will be made available to Member States through the Agency's training course programme.

B.1.1/6. The data bank and its associated models will be used together with the WASP model to provide assistance requested by Member States. A review will be made of methodologies for electric system expansion planning (Table B.9, No.1).

Outline of changes during 1983–86

B.1.1/7. The energy data bank will be updated as data for later years become available.

Economics of nuclear power and its fuel cycle (component B.1.2)

Objective

B.1.2/1. The objective is to monitor continuously the basic cost parameters determining the competitiveness of nuclear power plants in relation to conventional power plants and renewable energy sources and to prepare reports on the topics involved.

Results to date

B.1.2/2. The detailed survey of the capital investment costs of nuclear power plants that was carried out in 1978–79 will lead to a publication on the subject in 1980.

B.1.2/3. Computer programs for calculating the investment costs of light- and heavy-water nuclear plants have been adapted with the assistance of consulting engineering firms and used as a basis for the analysis of nuclear power programmes in developing countries.

B.1.2/4. A handbook on the technical aspects of nuclear power plant bid evaluation will be published in 1980.

Plans for 1981–82

B.1.2/5. The capital investment costs of electric power plants (both nuclear and conventional) will be the subject of a review and will lead in 1982 and 1983 to reports providing updated in-depth analyses of capital cost sensitivity to plant location, safety and environmental protection requirements and contractual terms, and cost trends with time (Table B.9, No.2).

B.1.2/6. Trends in the costs of nuclear raw materials and nuclear fuel cycle services will be reviewed and the current situation will be constantly monitored to develop projections of future trends (Table B.9, No.3).

B.1.2/7. In order to provide a basis for the comparative economic assessment of nuclear power, a compilation of data on the technical and cost prospects for power generation from renewable energy sources will be prepared with the help of consultants (Table B.9, No.4).

B.1.2/8. The guidebook on the economic evaluation of bids for electric power plants published in 1976 will be revised in 1981. This new edition will cover engineering economics, different methods of treating cost escalation and inflation during the construction and operation of a plant, conversion between different currencies and evaluation of the net costs or benefits arising from alternative financing plans.

B.1.2/9. Information obtained through the above activities will be used in assisting Member States with the planning of nuclear power programmes and in evaluating the future role of nuclear power.

Demand for nuclear raw materials and fuel cycle services (component B.1.3)

Objective

B.1.3/1. The objective is:
(a) To assess the nuclear fuel resource requirements and fuel cycle service needs which would ensue with alternative nuclear power deployment programmes and fuel cycle options; and
(b) To supply Member States with comprehensive surveys of the nuclear fuel cycle, including the IAEA/NEA periodical report on nuclear fuel cycle requirements.

Results to date

B.1.3/2. Work carried out in 1978–79 produced a computer model (SCENARIOS) of material flows and service requirements at each stage of the nuclear fuel cycle, thus providing a convenient tool for analysis of nuclear power programmes and alternative fuel cycle strategies to determine the needs for nuclear raw materials and fuel cycle services. The model is capable of treating demands separately for a number of world regions, thus allowing analysis of the geographical distribution. It was used for INFCE and will be applied in the future to Agency projections of requirements for nuclear fuels and fuel cycle services, including those developed for use in joint programmes with NEA. In addition, SCENARIOS will be made available to interested Member States and other international organizations.

Plans for 1981–82

B.1.3/3. Work will be completed during 1981–82 on extending SCENARIOS to include treatment of investment and operating cost parameters for fuel cycle facilities and power stations and the costs of nuclear fuel materials, thus producing overall cost estimates for alternative nuclear power programmes and fuel cycle strategies.

B.1.3/4. During 1981, a joint IAEA/NEA report will be published giving estimates of nuclear fuel resource requirements and fuel cycle service needs up to the year 2000, together with projections of the range of demands up to the year 2025 (Table B.9, No.5). Work will continue during 1982 and an updated report produced in 1983.

## SUB-PROGRAMME B.2

### Nuclear power programme implementation

OBJECTIVE

B.2/1. The objective is to assist Member States, in particular those which are developing countries, in the formulation of nuclear power programmes, especially with regard to the planning of the necessary infrastructure and the execution of nuclear power projects.

OUTLINE FOR 1981–86

B.2/2. In addition to the developing countries which now have nuclear power plants under construction or in operation, there are several which are actively considering the initiation of nuclear power programmes. This has led to a steady increase in requests for Agency advisory missions and for technical assistance – provided from the Agency's own resources or financed by UNDP – in the establishment of the necessary infrastructure (specialized education, supporting industries and organizations, quality assurance systems and so on). A shortage of qualified manpower at various levels is proving to be a major constraint on the transfer of nuclear technology and so continued emphasis will be placed on nuclear manpower development.

STRUCTURE

B.2/3. This sub-programme consists of three components, which are described in the following paragraphs.

## Nuclear power programme implementation

### Summary by programme components

Table B.5

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Survey of nuclear power applicability and constraints in developing countries | 1.1 | 0.7 | 101 700 | – | – | 2 300 | 104 000 |
| Assistance with technical planning and project-related activities and domestic infrastructure development | 2.6 | 1.2 | 230 500 | 13 000 | 9 000 | 13 500 | 266 000 |
| Manpower development | 1.0 | 1.0 | 102 800 | 13 000 | – | 12 200 | 128 000 |
| Linguistic services | – | – | – | – | – | 27 000 | 27 000 |
| Printing and publishing services | – | – | – | – | – | 11 000 | 11 000 |
| Data processing services | – | – | – | – | – | 4 000 | 4 000 |
| Conference services | – | – | – | – | – | 4 000 | 4 000 |
| TOTAL | 4.7 | 2.9 | 435 000 | 26 000 | 9 000 | 74 000 | 544 000 |

### Survey of nuclear power applicability and constraints in developing countries (component B.2.1)

#### Objective

B.2.1/1. The objective is to collect and evaluate information on both the potential demand for nuclear power in developing countries and the problems encountered in the execution of nuclear programmes in order to derive information of use for assistance activities.

#### Results to date

B.2.1/2. This component was initiated in 1971. The "Market Survey for Nuclear Power in Developing Countries", published in 1973, has provided a basis for the updating of potential future demand for nuclear power plants in developing countries in parallel with a continuing study of nuclear programme developments in these countries. This has been used in particular for defining infrastructure requirements for nuclear power programmes and a study of the special needs of developing countries made for INFCE. A seminar was held in India in 1979 to provide for an exchange of information (in particular between developing countries) on operational and maintenance problems in nuclear power plants.

B.2.1/3. In spite of the potentially large market for small and medium size nuclear power plants, their availability on the international market has continued to be uncertain. Assistance has been provided in two instances with the technical evaluation of bids for nuclear plants in the size range 50–125 MW(e).

B.2.1/4. The servicing of technical assistance projects and evaluation of fellowship applications and reports constituted a significant part of the workload during the period 1978–79.

#### Plans for 1981–82

B.2.1/5. The applicability of nuclear power in the developing countries will continue to be examined with the main purpose of identifying problems in important areas – such as manpower development, national infrastructures (organizational, industrial, technological and educational), the assurance of regular supplies and technology transfer – and thereby of assessing the need for information and advice from the Agency. The main vehicle for such advice will be

through special missions sent in response to requests from Member States. Close co-operation with the Division of Technical Assistance both in the planning of assistance and in the evaluation of projects will continue to be an essential factor in this work and will also constitute a significant part of the workload.

B.2.1/6. Operational and safety problems stemming from the interaction of small or weak grids on comparatively large generating plants will be made the subject of a guidebook to be published in 1982 (Table B.9, No.6).

B.2.1/7. Any new developments in the availability of small and medium power reactors will be monitored and assistance in technical bid specification and evaluation will be provided upon request for any specific proposal or project. It is planned to issue a review of the subject in 1982 (Table B.9, No.7).

Outline of changes during 1983–86

B.2.1/8. These activities will continue as a background to the provision of assistance to Member States, but efforts will probably be reduced as a better understanding is gained of the problems involved.

Assistance with technical planning and project-related activities and domestic infrastructure development (component B.2.2)

Objective

B.2.2/1. The objective is to assist developing countries in the formulation of nuclear power programmes and execution of projects, with particular attention to the advance planning of related infrastructures.

Results to date

B.2.2/2. This programme component has been modified through the transfer of economic optimization planning studies to the "Energy forecasts and the economic assessment of nuclear power and its fuel cycle" sub-programme. Efforts are now concentrated on technical and organizational problems. Four guidebooks on programme planning and bid evaluation were published between 1975 and 1979.

B.2.2/3. The review of technical assistance projects and evaluation of fellowship applications and reports constituted a significant part of the workload during the period 1978–79.

Plans for 1981–82

B.2.2/4. It is expected that an increasing number of requests will be received for assistance both in planning and in power plant construction. General advice will be provided through additional guidebooks. A revision of the publication "Steps to Nuclear Power" is planned for under the title "Introduction of Nuclear Power" (Table B.9, No.8). A guidebook for bid specifications for nuclear power plants (Table B.9, No.9) will be completed and another on nuclear power project management (Table B.9, No.10) will be started.

B.2.2/5. Particular aspects of infrastructure requirements will be taken up for detailed consideration. A study of plant maintenance problems will lead to a report on specialized manpower and industry support requirements associated with maintenance (Table B.9, No.11).

B.2.2/6. Advice and assistance will be provided through missions and expert assignments for major decisions in national programmes on such subjects as manpower, organization and infrastructure development.

Manpower development (component B.2.3)

Objective

B.2.3/1. The objective is to assess the manpower requirements for nuclear power programmes, to provide general advice on manpower development, to help Member States in evaluating their manpower needs and to provide comprehensive assistance to Member States in meeting them.

Results to date

B.2.3/2. This component was introduced in 1979. Activities have included technical support to nuclear power training courses and seminars. A total of 427 trainees from developing countries have attended the general overview courses for management staff on nuclear power project planning, construction and operation which were started in 1975. Eight specialized training courses in subjects such as power system planning, siting, quality assurance and operational safety have been held during 1978–80. A guidebook on nuclear manpower development has been published this year and a first advisory mission on manpower requirements was sent to a Member State in 1979. A major UNDP project on operator training at a simulator centre in Brazil has been serviced since 1976.

Plans for 1981–82

B.2.3/3. The programme of nuclear power training courses will be continued into 1981 but the general courses for management-level personnel will be phased out and replaced by about eight specialized courses annually on subjects which are otherwise not available, such as safety report evaluation, quality assurance and power system planning. The desirability and feasibility of providing other training opportunities, such as specialized courses in Member States and travelling seminars on specialized subjects, will be evaluated.

B.2.3/4. In view of the suggestion emerging from INFCE that an international technology centre to ensure the availability of practical training and access to expert advice could be of importance to developing countries and that such a centre might be based on existing facilities in Member States used in such a way as to provide a combination of formal and on-the-job training in specialized subjects, a study will be made of the possibility of the Agency being involved in such a programme (Table B.9, No.12).

B.2.3/5. An Agency study to evaluate the desirability and feasibility of setting international guidelines for the qualification of designated types of personnel will be completed (Table B.9, No.13).

Outline of changes during 1983–86

B.2.3/6. The overall training effort will be maintained but will be distributed over a wider range of specialized subjects and methods.

## SUB-PROGRAMME B.3

### Technology of nuclear power plants of proven types

OBJECTIVE

B.3/1. The objective is to provide Member States with up-to-date and authoritative information on the technological status of and operating experience with nuclear power plants of proven types and to make recommendations regarding principles, methods and techniques to be applied in the design, construction and operation of nuclear power plants so as to achieve required levels of quality assurance and satisfactory performance, and also to investigate future potential applications of these types of reactor including the supply of low-temperature heat.

OUTLINE FOR 1981–86

B.3/2. The annual publications on operating experience will be continued and expanded to include safety-related experience and the evaluation will be increased to provide information in greater depth. Data on nuclear power plant systems will be collected with the help of international working groups or Technical Committees, but greater stress will be placed on the presentation of evaluated information.

B.3/3. With the completion of the quality assurance guides under the NUSS programme, work will be directed more towards providing practical guidance to plant owners and operators.

B.3/4. Future potential applications of nuclear power will be studied from a technical systems point of view as a supplement to the economic studies. Low-temperature heat applications will also be considered.

STRUCTURE

B.3/5. This sub-programme consists of three components, which are described in the following paragraphs.

Technology of nuclear power plants of proven types

Summary by programme components

Table B.6

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Survey of nuclear power plant operating experience and system performance | 2.9 | 1.6 | 230 600 | 32 000 | – | 7 400 | 270 000 |
| Quality assurance for nuclear power plants | 1.9 | 0.8 | 136 500 | 32 000 | 18 000 | 4 500 | 191 000 |
| Potential applications of nuclear power | 0.9 | 0.5 | 72 400 | – | 8 000 | 2 600 | 83 000 |
| Linguistic services | – | – | – | – | – | 27 000 | 27 000 |
| Printing and publishing services | – | – | – | – | – | 49 000 | 49 000 |
| Conference services | – | – | – | – | – | 15 000 | 15 000 |
| TOTAL | 5.7 | 2.9 | 439 500 | 64 000 | 26 000 | 105 500 | 635 000 |

Survey of nuclear power plant operating experience and system performance (component B.3.1)

Objective

B.3.1/1. The objective is: to collect, evaluate and publish annually data on nuclear power plant performance, including safety aspects; and to collect, evaluate and disseminate information on the principles, methods and techniques used to achieve reliability and safety in reactor systems as a basis for the preparation of guides and engineering manuals.

Results to date

B.3.1/2. The report "Operating Experience with Nuclear Power Stations in Member States" has been issued annually since 1970, supplemented by a "Performance Analysis Report" since 1975. A computer-produced listing of "Power Reactors in Member States" has been published annually since 1975.

B.3.1/3. The International Working Groups on the Reliability of Reactor Pressure Components (IWG-RRPC) and on Nuclear Power Plant Control and Instrumentation (IWG-NPPCI) were established in 1967 and 1970 respectively. They have organized two or three specialists' meetings each year. Their activities are reviewed periodically, the most recent reviews having been undertaken in 1980. Two co-ordinated research programmes (one now completed) on irradiation embrittlement of pressure vessel steels have given results of international significance (Table B.8, No.1). A guidebook on nuclear power plant control and instrumentation was prepared for publication this year.

B.3.1/4. Servicing technical assistance projects and evaluating fellowship requests and reports constituted a significant part of the workload during the period 1978–79.

Plans for 1981–82

B.3.1/5. It is planned to include safety-related information, in particular on abnormal occurrences, in the annual operating experience reports. Guidelines for reporting such occurrences will be prepared jointly with the Division of Nuclear Safety (Table B.9, No.14). The continuing review of the reactor listing and operating experience reports, performed also in co-ordination with UNIPEDE and WEC, should result in better in-depth evaluation of the considerable experience data which have been accumulated. During this period, the format for the information collection whould be improved to permit easier processing and preparation of the analytical reports. A manual on reporting and evaluating experience will be prepared (Table B.9, No.15).

B.3.1/6. It is planned to discontinue the annual meetings of the IWG-RRPC and IWG-NPPCI in their present form. Technical safety issues should play a larger rôle in the programme areas which have been the concern of these groups. For instance, work towards a common understanding and common definitions on the growth, detection and surveillance of cracks in pressure components and on problems in the man-machine interface in nuclear power plant control will be given more attention. With this change in programme direction it must also be considered whether a more flexible means of consultation with essentially the same Member States now represented in the working groups would not be more appropriate. Accordingly, no meetings of these working groups are planned for 1981 and 1982, but Technical Committee meetings will be held to review the subjects of pressure components and control and instrumentation (Table B.9, Nos.16 and 17). Reports will also be prepared, as part of the programme trends given above, on pressure system defect detection and sizing (Table B.9, No.18) and on on-line computers for protection systems and automatic control (Table B.9, No.19). In addition, a report on the reliability of primary circuit pumps will be drawn up with the aid of specialists (Table B.9, No.20).

B.3.1/7. In order to review the general status of developments in nuclear power plant control and instrumentation, particularly in the light of the TMI-2 accident, a symposium will be held in 1982 (Annex II (1)). An assessment of water chemistry and corrosion problems, which undoubtedly are of major long-term significance for both the safety and reliability of nuclear power plants, will be made in another symposium the same year (Annex II (2)). Specialists' meetings (Table B.9, No.21) are planned for 1982 on subjects to be defined in the review of programme activities being made this year.

B.3.1/8. A guidebook will be produced on the acquisition of control and instrumentation technology for countries embarking upon nuclear power programmes (Table B.9, No.22).

B.3.1/9. The co-ordinated research programme on irradiation behaviour of advanced pressure vessel steels (Table B.8, No.1) will be completed in 1982 with the issue of a final report in 1983.

Outline of changes during 1983–86

B.3.1/10. The possibility of using available data to predict potential classes of safety problems will be studied.

Co-operation with other organizations

B.3.1/11. Collection and evaluation of operating experience information will, as in the past, be carried out in co-operation with CEC, UNIPEDE and WEC.

Quality assurance for nuclear power plants (component B.3.2)

Objective

B.3.2/1. The objective is to complete work on the quality assurance safety guides within the framework of the NUSS programme and to prepare additional, operator-oriented engineering guides on quality assurance.

Results to date

B.3.2/2. Most of the work on quality assurance (QA) has been carried out under the NUSS programme. The international code of practice on quality assurance was issued in 1978 and two safety guides have been published with eight additional ones being completed.

B.3.2/3. The servicing of technical assistance projects and evaluation of fellowship requests and reports have represented a significant part of the workload.

Plans for 1981–82

B.3.2/4. The remaining eight QA safety guides under the NUSS programme will be completed during 1981–82. Quality assurance activities will consequently take a new direction towards the preparation of manuals and procedures for quality assurance programmes at various stages of nuclear power projects with emphasis on such questions as methods and techniques for auditing quality assurance programmes (Table B.9, No.23).

B.3.2/5. A symposium on quality assurance of nuclear power plants will be held in 1981 in order to assess and provide information about the way that the Agency's code and safety guides are being used and to evaluate further requirements for Agency action in this important area (Annex I (1)).

Outline of changes during 1983–86

B.3.2/6. The trend towards supplying more practical information and guidelines for Member States will be further reinforced with preparation of manuals for the testing and inspection of plant systems during construction and operation.

## Potential applications of nuclear power (component B.3.3)

Objective

B.3.3/1. The objective is to study the potential contribution of nuclear power to the supply of both electricity and low-temperature heat in the 1990s, taking into account the long lead times for nuclear projects and the uncertainties in economics-based forecasting techniques.

Results to date

B.3.3/2. This new component includes an earlier one with the title "Applications of low-temperature nuclear heat", under which developments in nuclear district heating and process heat uses have been monitored for a long period. A review article on the subject was published in 1979 in Atomic Energy Review, but developments have not justified the holding of meetings on these subjects as no new information has become available.

Plans for 1981–82

B.3.3/3. Some effort will be devoted to studying the possible market situation which nuclear power may face in the 1990s from a purely technical point of view in order to supplement the normal forecasting work. On the one side information will be sought from industrialized countries on studies of potential uses of electricity and low-temperature heat; on the other, case history studies of suppressed electricity demand will be sought from developing countries, particularly concerning large and rapidly growing urban areas. A first review report consolidating preliminary findings will be prepared in 1982 (Table B.9, No. 24).

Outline of changes during 1983–86

B.3.3/4. Expansion or phasing out of these activities will be decided upon in the light of experience gained in 1981.

Co-operation with other organizations

B.3.3/5. Co-operation will be required with national energy research organizations and international bodies including UNCNRET, the regional economic commissions and IBRD.

## SUB-PROGRAMME B.4

### Advanced nuclear power technology

OBJECTIVE

B.4/1. The objective is to foster information exchange and other forms of collaboration among Member States engaged in the development of advanced nuclear power reactors and also to carry out activities related to the use of power reactor physics computation methods for in-core fuel management analysis, with the emphasis on assisting developing countries.

OUTLINE FOR 1981–86

B.4/2. Emphasis will continue to be placed on fast breeder (FBR) and high-temperature gas-cooled (HTR) reactor development, with greater attention being given to the exchange of information on operating experience.

B.4/3. Advanced reactor and fuel cycle concepts will be monitored and assessed. The status of fusion reactor prospects and related technological development will be reviewed.

B.4/4. Activities relating to the physics of reactor operation will be limited to assisting developing countries with assuring the safe operation of nuclear power reactors.

STRUCTURE

B.4/5. This sub-programme consists of three components, which are described in the following paragraphs.

### Advanced nuclear power technology

Summary by programme components

Table B.7

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Power reactor technology | 2.2 | 1.4 | 191 800 | 15 000 | 9 000 | 5 200 | 221 000 |
| Reactor and fuel cycle concepts | 1.0 | 0.5 | 85 600 | 5 000 | – | 3 400 | 94 000 |
| In-core fuel management | 1.0 | 0.5 | 91 400 | – | 26 000 | 1 600 | 119 000 |
| Linguistic services | – | – | – | – | – | 27 000 | 27 000 |
| Printing and publishing services | – | – | – | – | – | 188 000 | 188 000 |
| Conference services | – | – | – | – | – | 7 000 | 7 000 |
| TOTAL | 4.2 | 2.4 | 368 800 | 20 000 | 35 000 | 232 200 | 656 000 |

Power reactor technology (component B.4.1)

Objective

B.4.1/1. The objective is to assist Member States in the co-ordination of research efforts through information exchange and to inform them of the status of fast breeder and high-temperature gas-cooled reactor programmes.

Results to date

B.4.1/2. The International Working Group on Fast Reactors (IWGFR), which is composed of representatives of Member States with large development programmes in the field of fast breeder reactor technology, has met annually to exchange information on the status of national programmes and to review and make recommendations on the Agency's activities in this field.

B.4.1/3. Under the auspices of IWGFR, topics such as the theoretical modelling of fuel pin behaviour, the use of bellows for sodium systems, the problems of carbon in sodium, methods for demonstrating structural integrity under faulted conditions, and in-service inspection and design for improved safety characteristics were examined in 1979–80 and reports have been published. A symposium on fast reactor physics was held in 1979.

B.4.1/4. In 1975, a symposium on gas-cooled reactors, with emphasis on advanced systems, showed that many countries were interested in the full development of the HTR concept, including exploitation of the thorium fuel cycle. Meetings to review progress in HTR development programmes took place annually, and in 1978 and 1979 the first meetings were held of an international working group on HTRs (IWGHTR), composed of representatives of Member States with development programmes in the field of HTRs and other advanced gas-cooled reactors such as AGRs. Subsequently, specialists' meetings have been held on pre-stressed concrete reactor pressure vessels, mechanical properties of graphite for HTR applications and process heat applications technology. In 1980 the name of the working group was changed to the International Working Group on Gas-Cooled Reactors (IWGGCR).

Plans for 1981–82

B.4.1/5. It is planned to discontinue the annual meetings of the IWGGCR (IWGHTR) in their present form. Assessments of the status of fast breeder reactor development will be made as construction and operating experience on new demonstration plants becomes available (Table B.9, No.25); in addition, IWGFR will examine its activities with a view to focusing the work of its meetings on priority areas such as safety. Specialists' meetings will be held in 1981 on (a) fast reactor design for improved safety characteristics, (b) fast reactor fuel failure detection and location, and (c) boiling noise detection in fast reactors; in 1982, three specialists' meetings will be held on topics to be formulated in 1981 (Table B.9, No.26).

B.4.1/6. The IWGGCR will hold its next meeting in 1981 (Table B.9, No.27) to plan specialists' meetings and other activities for 1982 (Table B.9, No.28). The development of materials suitable for service in high-temperature applications such as for steam- and hydro-gasification of coal will be assessed (Table B.9, No.29). A review will be made of the HTR fuel cycle and its potential for reducing uranium resource requirements (Table B.9, No.30).

Co-operation with other organizations

B.4.1/7. Co-operation with NEA and CEC will continue.

Reactor and fuel cycle concepts (component B.4.2)

Objective

B.4.2/1. The objective is to promote the exchange of information on projects relating to the technological assessment and development of advanced reactor and fuel cycle concepts and fusion reactors.

Results to date

B.4.2/2. In the field of advanced thermal reactors, the status and prospects of thermal breeder and near-breeder reactors were reviewed by consultants during the period 1975–78 and a final report published in 1979. In the field of advanced fast reactors, a study group on gas-cooled fast breeders met in 1972 to review the reactor design studies and supporting research efforts being carried out in various countries. A workshop on fusion reactor design problems was held in 1974, a Technical Committee on design aspects of large-scale tokamak experiments in 1975, a Technical Committee and workshop on fusion reactor design in 1977 and an Advisory Group meeting on fusion reactor materials in 1979.

Plans for 1981–82

B.4.2/3. A review of current design concepts will be made to define the technological developments needed to achieve practical fusion reactor power (Table B.9, No.31). With the help of consultants, the fusion reactor technology programme will be updated on the basis of the results of the workshop (Table B.9, No.32).

B.4.2/4. A review of materials suitable for operation under the conditions expected in a fusion reactor will be made with the aid of experts from the materials community and systems analysis groups (Table B.9, No.33) in order to define needs for materials research aimed at making fusion useful, practical and economic. The meeting will be held immediately following the workshop (see para. B.4.2/3).

B.4.2/5. Progress in gas-cooled fast breeder reactors and alternative advanced thermodynamic cycles (including the $N_2O_4$ dissociation cycle) will be reviewed (Table B.9, No.34).

Outline of changes during 1983–86

B.4.2/6. A conference on fusion reactor materials is planned in co-operation with other organizations.

In-core fuel management (component B.4.3)

Objective

B.4.3/1. The objective is to foster the dissemination of information on calculational methods for in-core fuel management analysis for commercially available nuclear power reactors, with the emphasis on assisting developing countries.

Results to date

B.4.3/2. Agency activities in this field have included three meetings and a symposium in 1977 on reactor shielding. A co-ordinated research programme on transport theory and advanced reactor calculations was completed in 1979 and the final report will be published this year.

B.4.3/3. An advanced review course on reactor theory and power reactors, for reactor physicists from developing countries, was organized in co-operation with the International Centre for Theoretical Physics (ICTP) in 1978. A course in the operational physics of power reactors with workshops in the use of computer methods will be held in 1980.

B.4.3/4. The servicing of research contracts and agreements and evaluation of fellowship applications and reports has constituted a significant part of the workload.

Plans for 1981–82

B.4.3/5. Training courses in co-operation with the ICTP in the operational physics of power reactors available to developing countries will be supported. A report will be prepared in 1981 summarizing the lecture notes for the 1980 IAEA/ICTP course.

B.4.3/6. Development work on a set of computer codes for power reactor in-core fuel management analysis that are suitable for use on small computers typically available in developing countries will be continued.

## Co-ordinated research programmes

Table B.8

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Behaviour of advanced reactor pressure vessel steels | 1 | 9 | 1977 | 1982 |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS (TCs, AGs and consultants' meetings)

Table B.9

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | Technical Report on review of methodology used by the Agency for electric system expansion planning | Agency Secretariat for advising Atomic Energy Commissions (AEC) and planning organizations of Member States | AG 1982/1 | 1983 | B.1 1/6 |
| 2 | Annual Report on power plant capital investment and operating and maintenance costs | AECs and energy, industry and planning organizations | AG 1981/1<br>AG 1982/2 | 1982<br>1983 | B.1.2/5 |
| 3 | Annual Report on cost data for nuclear fuel cycle materials and services | As above | Consultants' meetings in 1981 and 1982 | 1982<br>1983 | B.1.2/6 |
| 4 | Technical Report on status and economics of new power generation and storage technologies | Agency Secretariat when advising AECs and planning organizations of Member States | Consultants' meeting in 1982 | 1983 | B.1.2/7 |
| 5 | Biennial Report on nuclear fuel cycle requirements | AECs and energy, industry and planning organizations | Joint IAEA/NEA working party 1981/82 | 1981 | B.1.3/4 |
| 6 | Guidebook on the interaction of grids on the design and performance of nuclear power plants | Plant designers, operators and regulatory bodies, particularly in developing countries | Consultants' meeting in 1981 | 1982 | B.2.1/6 |
| 7 | IAEA-TECDOC, status report on small and medium power reactors | AECs and utilities, primarily in developing countries | TC 1982/3 | 1982 | B.2.1/7 |
| 8 | Introduction of Nuclear Power (Revision of Technical Reports Series 164) | Basic check list for AECs, Ministries of Energy, utilities and regulatory bodies in developing countries | AG 1981/3 | 1982 | B.2.2/4 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 9 | Guidebook on bid specifications for nuclear power plants | Project groups in utilities and AECs, particularly in developing countries | Consultants' meeting in 1981 | 1982 | B.2.2/4 |
| 10 | Guidebook on nuclear power project management | Utilities and AECs in developing countries | AG 1982/4 | 1983 | B.2.2/4 |
| 11 | Technical Report on requirements for specialized manpower and industry support resulting from maintenance | As above | Consultants' meeting in 1981<br>TC 1982/5 | 1982 | B.2.2/5 |
| 12 | IAEA-TECDOC on the feasibility of an international technology centre | Agency Secretariat | TC 1981/4 | 1981 | B.2.3/4 |
| 13 | Internal report on standards for manpower qualifications | Agency Secretariat | Consultants' meeting in 1981 | 1981 | B.2.3/5 |
| 14 | Guidelines for reporting and analysing abnormal occurrences in nuclear power plants | Regulatory bodies and operators | AG 1981/5 | 1981 | B.3.1/5 |
| 15 | Manual on reporting and evaluating operating experience with nuclear power plants | Plant operators, regulatory bodies, designers and manufacturers | AG 1982/6 | 1983 | B.3.1/5 |
| 16 | Technical Report on pressure components with proposals for co-ordinated work and preparation of international guides and manuals | Research and development institutes, AECs and industry in participating Member States | TC 1982/7 | 1982 | B.3.1/6 |
| 17 | Technical Report on control and instrumentation with proposals for co-ordinated work and preparation of international guides and manuals | As above | TC 1982/8 | 1982 | B.3.1/6 |
| 18 | Report on defect detection and sizing with recommendations for Agency programme (internal report and external limited-distribution report published by host country) | Research institutes, manufacturers, QA groups and Agency Secretariat | Specialists' meeting 1981/6 | 1981 | B.3.1/6 |
| 19 | Report on on-line computers for protection systems and automatic control (published by host country) | Control system designers, plant operators and regulatory bodies | Specialists' meeting 1981/7 | 1981 | B.3.1/6 |
| 20 | Report on reliability of primary circuit pumps (to be published by host country) | Manufacturers and plant operators | Specialists' meeting 1981/8 | 1981 | B.3.1/6 |
| 21 | Reports from specialists' meetings | Depends on detailed programme to be formulated in 1980 | Specialists' meetings 1982/9–12 | 1982 | B.3.1/7 |
| 22 | Guidebook on acquisition of control and instrumentation technology for countries embarking on nuclear power programmes | AECs and utilities in developing countries | Specialists' meeting 1981/9 (possibly with consultants) | 1982 | B.3.1/8 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 23 | Manual for auditing quality assurance (QA) programmes for nuclear power plants | QA groups with utilities, manufacturers and regulatory bodies | AG 1982/13 | 1982 | B.3.2/4 |
| 24 | Preliminary report on possible uses of nuclear power in the 1990s | AECs and energy planners | AG 1982/14 | 1982 | B.3.3/3 |
| 25 | IAEA-TECDOCs on fast breeder reactor development | Research and development institutes and AECs in participating Member States | TC 1981/10<br>TC 1982/15 | 1981<br>1982 | B.4.1/5 |
| 26 | Reports of specialists' meetings (fast breeder reactors) | Research and development institutes and AECs in IWGFR participating countries | Specialists' meetings 1981/11–13 1982/16–18 | 1982–83 | B.4.1/5 |
| 27 | Report of IWGGCR, containing programme of work and recommendations for Agency activities in the area of high-temperature gas-cooled reactors for 1981–83 | AECs in participating States concerned with gas-cooled reactor development programmes and prospects | TC 1981/14 | 1981 | B.4.1/6 |
| 28 | Reports of specialists' meetings (gas-cooled reactors) | Depends on detailed programme to be formulated in 1981 | Specialists' meetings 1982/19 and 1982/20 | 1982 | B.4.1/6 |
| 29 | IAEA-TECDOC, recommendations on high-temperature materials for nuclear process heat and electricity production applications | Research and development institutes and AECs in IWGGCR participating countries | Specialists' meeting 1981/15 | 1981 | B.4.1/6 |
| 30 | IAEA-TECDOC on the high-temperature reactor cycle | As above | Specialists' meeting 1981/16 | 1982 | B.4.1/6 |
| 31 | IAEA-TECDOC on fusion reactor design and technology | Fusion research and development authorities, institutions and organizations concerned with development of fusion reactor technology | TC 1981/17 | 1982 | B.4.2/3 |
| 32 | IAEA-TECDOC, recommendations on fusion reactor technology programme | Agency Secretariat | Consultants' meeting in 1982 | 1982 | B.4.2/3 |
| 33 | IAEA-TECDOC on development goals for fusion reactor materials | Research and development institutes and AECs concerned with development of fusion reactors | Consultants' meeting in 1981 | 1982 | B.4.2/4 |
| 34 | Technical Report on gas-cooled fast reactors and advanced thermodynamic cycles | AECs, research and development institutes in member countries of the IWGFR and the IWGGCR concerned with alternative advanced reactor concepts | Specialists' meeting 1981/18 | 1981 | B.4.2/5 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Advisory Group on review of recent experience in nuclear power investment costs | B.1.2/5 |
| 2. | Joint IAEA/NEA Working Party on nuclear fuel cycle demand | B.1.3/4 |
| 3. | Advisory Group on revision of "Steps to Nuclear Power" | B.2.2/4 |
| 4. | Technical Committee on the establishment of a technology centre under IAEA auspices | B.2.3/4 |
| 5. | Advisory Group on analysis of abnormal occurrences in nuclear power plants | B.3.1/5 |
| 6. | Specialists' meeting on reliability of defect detection and sizing (IWG) | B.3.1/6 |
| 7. | Specialists' meeting on use of on-line computers for protection systems and automatic control (IWG) | B.3.1/6 |
| 8. | Specialists' meeting on reliability of primary circuit pumps (IWG) | B.3.1/6 |
| 9. | Specialists' meeting on acquisition of control and instrumentation technology for countries embarking on nuclear power programmes (IWG) | B.3.1/8 |
| 10. | Technical Committee on fast breeder reactor development (IWG) | B.4.1/5 |
| 11. | Specialists' meeting on fast reactor design for improved safety characteristics | B.4.1/5 |
| 12. | Specialists' meeting on fast reactor fuel failure detection and location | B.4.1/5 |
| 13. | Specialists' meeting on boiling noise detection in fast reactors | B.4.1/5 |
| 14. | Technical Committee meeting on programme and recommendations for Agency activities in area of high-temperature gas-cooled reactors for 1981–83 | B.4.1/6 |
| 15. | Specialists' meeting on high-temperature materials for nuclear process heat and electricity production applications | B.4.1/6 |
| 16. | Specialists' meeting on high-temperature reactor fuel cycle | B.4.1/6 |
| 17. | Technical Committee on fusion reactor concepts and materials | B.4.2/3 |
| 18. | Specialists' meeting on gas-cooled fast reactors and advanced thermodynamic cycles | B.4.2/5 |

| 1982 | | |
|---|---|---|
| 1. | Advisory Group on electric system expansion planning | B.1.1/6 |
| 2. | Advisory Group on review of recent experience of power plant investment and O & M costs | B.1.2/5 |
| 3. | Technical Committee on small and medium power reactors | B.2.1/7 |
| 4. | Advisory Group on guidebook on nuclear power project management | B.2.2/4 |
| 5. | Technical Committee on specialized manpower and industry support requirements resulting from maintenance | B.2.2/5 |
| 6. | Advisory Group on reporting and evaluating operational experience with nuclear power plants | B.3.1/5 |
| 7. | Technical Committee on reactor pressure components | B.3.1/6 |
| 8. | Technical Committee on nuclear power plant control and instrumentation | B.3.1/6 |
| 9–12. | Specialists' meetings on topics to be formulated in 1980 (power plant control and instrumentation) | B.3.1/7 |

| 1982 | | Paragraph |
|---|---|---|
| 13. | Advisory Group on manual for auditing of quality assurance programmes for nuclear power plants | B.3.2/4 |
| 14. | Advisory Group on possible applications of nuclear power in the 1990s | B.3.3/3 |
| 15. | Technical Committee on fast breeder reactor development (IWG) | B.4.1/5 |
| 16–18. | Specialists' meetings on topics to be formulated in 1981 (fast breeder reactors) | B.4.1/5 |
| 19–20. | Specialists' meetings on topics to be formulated in 1981 (gas-cooled reactors) | B.4.1/6 |

# C. NUCLEAR FUEL CYCLE

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table C.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | – | 1 230 000 | 70 000 | – | 70 000 | 1 300 000 | 1 379 000 | 1 437 000 |
| Consultants | – | 64 300 | 8 800 | 36 800 | 45 600 | 109 900 | 147 000 | 149 000 |
| Overtime | – | 2 600 | 200 | 900 | 1 100 | 3 700 | 6 400 | 6 700 |
| Temporary assistance | – | 1 100 | 100 | – | 100 | 1 200 | 1 100 | 1 000 |
| Sub-total | – | 1 298 000 | 79 100 | 37 700 | 116 800 | 1 414 800 | 1 533 500 | 1 593 700 |
| Common staff costs | – | 356 600 | 39 300 | – | 39 300 | 395 900 | 426 900 | 444 900 |
| Travel | – | 37 700 | 5 800 | 24 600 | 30 400 | 68 100 | 91 800 | 98 800 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | – | 107 000 | 12 000 | (54 000) | (42 000) | 65 000 | 96 000 | 131 000 |
| Technical committees, advisory groups | – | 252 000 | 38 000 | 23 000 | 61 000 | 313 000 | 408 000 | 418 000 |
| Representation and hospitality | – | 8 700 | 700 | (200) | 500 | 9 200 | 11 600 | 12 000 |
| Scientific and technical contracts | – | 174 000 | 12 000 | (11 000) | 1 000 | 175 000 | 185 000 | 185 000 |
| Common services, supplies and equipment | – | 3 000 | 100 | (100) | – | 3 000 | 34 200 | 7 600 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | – | 96 000 | 4 000 | (27 000) | (23 000) | 73 000 | 86 000 | 85 000 |
| Printing and publishing services | – | 319 000 | 32 000 | (40 000) | (8 000) | 311 000 | 313 000 | 302 000 |
| Data processing services | – | 35 000 | (1 000) | (4 000) | (5 000) | 30 000 | 37 000 | 44 000 |
| Conference services | – | 54 000 | 4 000 | 1 000 | 5 000 | 59 000 | 91 000 | 107 000 |
| TOTAL | – | 2 741 000 | 226 000 | (50 000) | 176 000 | 2 917 000 | 3 314 000 | 3 429 000 |

## SUMMARY OF MANPOWER

Table C.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | – | – | – | 1 | 1 | 1 | 1 |
| P-5 | – | – | 8 | (1) | 7 | 7 | 7 |
| P-4 | – | – | 12 | – | 12 | 12 | 12 |
| Sub-total | – | – | 20 | – | 20 | 20 | 20 |
| GS | – | – | 12 | – | 12 | 12 | 12 |
| TOTAL | – | – | 32 | – | 32 | 32 | 32 |

## CHANGES IN COSTS AND MANPOWER

### Costs

C/1. As will be seen from Table C.1 above, it is expected that the cost of this programme will increase by $176 000 as a net result of salary and other price increases of $226 000 and a programme decrease of $50 000.

C/2. Programme increases in respect of consultants' services ($36 800), overtime ($900) and duty travel ($24 600) are related mainly to the "Waste management" sub-programme.

C/3. The programme decrease of $54 000 in respect of "Conferences, symposia, seminars" reflects a decrease in the number of meetings in the "Waste management" sub-programme. While the 1980 Adjusted budget provided for a total of $107 000 in respect of three symposia in the field of waste management, the 1981 estimates foresee only a total of $65 000 in respect of one symposium and one seminar. The programme increase of $23 000 in respect of technical committees and advisory groups is related to an increase in the number of meetings foreseen in both sub-programmes.

C/4. The programme decrease of $11 000 in respect of scientific and technical contracts is related to both sub-programmes.

C/5. As regards the allocation of service costs, the programme decreases in respect of linguistic services ($27 000) and printing and publishing services ($40 000) are the net results of decreases in the "Nuclear materials and fuel cycle technology" sub-programme partly offset by increases in the "Waste management" sub-programme. Data processing services, which show a programme decrease of $4 000, are provided only for the "Nuclear materials and fuel cycle technology"sub-programme. A programme increase of $1 000 is foreseen in respect of conference services.

### Manpower

C/6. Table C.2 reflects, in the "1980 Adjusted" column, the reorganization of the Department of Technical Operations, in the course of which 20 Professional posts and 12 GS posts are being transferred to the newly established "Nuclear Fuel Cycle" programme. Nine Professional posts (2 at the P-5 and 7 at the P-4 level) and five GS posts are from the Division of Nuclear Power and Reactors, and six P-5, five P-4 and seven GS posts are from the Division of Nuclear Safety and Environmental Protection.

C/7. In 1981 the reclassification of one P-5 post to the D level is required for the Director of the new Division.

C/8. No further changes are foreseen for 1982 and 1983.

## Summary of manpower and costs by sub-programme

Table C.3

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years P | Man-years GS | Costs | Man-years P | Man-years GS | Costs | Man-years P | Man-years GS | Costs |
| Nuclear materials and fuel cycle technology | 9.0 | 5.0 | 986 000 | 9.0 | 5.0 | 1 068 000 | 9.0 | 5.0 | 1 176 000 |
| Waste management | 11.0 | 7.0 | 1 931 000 | 11.0 | 7.0 | 2 246 000 | 11.0 | 7.0 | 2 253 000 |
| TOTAL | 20.0 | 12.0 | 2 917 000 | 20.0 | 12.0 | 3 314 000 | 20.0 | 12.0 | 3 429 000 |

## THE PROGRAMME

### OBJECTIVE

C/9. The objective is to promote the exchange of information between Member States on technical, environmental and economic aspects of nuclear fuel cycle technology, to provide assistance to Member States in the planning, implementation and operation of nuclear fuel cycle facilities and to assist in the development of advanced nuclear fuel cycle technology. This will be done in particular by:

(a) Collecting and disseminating evaluated and systematized information on subjects such as:

- (i) nuclear materials, resources and supply;
- (ii) reactor fuel technology, performance and reliability;
- (iii) spent fuel management;
- (iv) the handling and treatment of radioactive wastes at nuclear fuel cycle facilities;
- (v) the underground disposal of radioactive wastes; and
- (vi) environmental aspects of the nuclear fuel cycle;

(b) Co-operating in the development of guidelines and in the preparation of nuclear fuel cycle safety codes and guides;

(c) Giving interested Member States technical advice in connection with their nuclear fuel cycle programmes; and

(d) Assessing technical and environmental aspects of nuclear fuel cycle development in Member States.

### STRUCTURE

C/10. This programme consists of two sub-programmes, which are dealt with separately below.

*(see Table C.3)*

## SUB-PROGRAMME C.1

### Nuclear materials and fuel cycle technology

### OBJECTIVE

C.1/1. The objective is to maintain an up-to-date picture of world uranium and thorium resources and production, to advise developing Member States on the exploration, development and economical exploitation of their indigenous resources, and to collate information on the various stages of the nuclear fuel cycle, including mining, milling, refining, conversion, isotope separation, fuel fabrication, fuel performance and spent fuel management.

### OUTLINE FOR 1981–86

C.1/2. Uranium and thorium resource evaluation will continue in co-operation with NEA and other organizations in order to provide a world-wide picture. The computerized International Uranium Geology Information System (INTURGEO) will become operational.

C.1/3. In view of the special needs of developing countries, attention will be given to the technical aspects of ore mineralization and ore extraction techniques, uranium refining and conversion.

C.1/4. Current work on fuel element technology and performance will continue for thermal and advanced reactor fuels with a view to achieving better utilization of nuclear materials, improved fuel reliability and safe operation of nuclear power plants.

C.1/5. Further studies will be made on spent fuel management. Technical advice and guidance will be given to international studies as the need arises.

## STRUCTURE

C 1/6. This sub-programme consists of three components, which are described in the following paragraphs.

Nuclear materials and fuel cycle technology

Summary by programme components

Table C.4

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Nuclear materials, resources and supply | 4.0 | 2.2 | 335 300 | 20 000 | 27 000 | 14 700 | 397 000 |
| Reactor fuel technology, performance and reliability | 4.0 | 2.0 | 333 300 | 18 000 | 9 000 | 3 700 | 364 000 |
| Spent fuel management | 1.0 | 0.8 | 81 900 | – | 9 000 | 5 100 | 96 000 |
| Linguistic services | – | – | – | – | – | 27 000 | 27 000 |
| Printing and publishing services | – | – | – | – | – | 66 000 | 66 000 |
| Data processing services | – | – | – | – | – | 30 000 | 30 000 |
| Conference services | – | – | – | – | – | 6 000 | 6 000 |
| TOTAL | 9.0 | 5.0 | 750 500 | 38 000 | 45 000 | 152 500 | 986 000 |

### Nuclear materials, resources and supply (component C.1.1)

Objective

C.1.1/1. The objective is to maintain an up-to-date picture of world uranium and thorium resources and production by collecting and disseminating information on related subjects such as uranium geology, exploration and evaluation techniques, mining and ore processing, and to assist and advise Member States in connection with the exploration, development and economical exploitation of their indigenous resources.

Results to date

C.1.1/2. During the period 1974–80, three symposia, eight Advisory Group or Technical Committee meetings, seven consultants' meetings and a number of special working group meetings or workshops were held on uranium geology, exploration, evaluation and ore processing, and corresponding proceedings were published or are under publication.

C.1.1/3. The NEA/IAEA Working Party on Uranium Resources reviewed and issued reports on uranium resources, production and demand in 1975, 1977 and 1979, and a report on the world's uranium potential was issued in 1978 through the International Uranium Resources Evaluation Project (IUREP). A substantial contribution was also made to INFCE.

C.1.1/4. The computerized International Uranium Geology Information System (INTURGEO) was established in 1979. The files are designed for storing information on regional geology, uranium exploration, uranium deposits and national uranium statistics. INTURGEO now contains approximately 20% of the information it will ultimately hold.

C.1.1/5. A new joint NEA/IAEA group of experts on Research and Development in Uranium Exploration Techniques was set up in late 1976 and has selected for consideration nine subjects suggested by member countries of both organizations (Case Histories in Uranium Exploration, Uranium Favourability Assessment by Mineral Analysis, Gases in Uranium Exploration, Improvements in the Measurement of Natural Gamma Radiation, Borehole Logging in Uranium Exploration, Recognition of Uraniferous Zones, Biogeochemistry in Uranium Exploration, Uranium in Granites, and Subsurface Geophysical Techniques in Uranium Exploration). Appropriate working groups have been organized and their activities are in progress. One of the subject reviews was completed in late 1979 (Case Histories in Uranium Exploration) and a report will be issued in 1980.

C.1.1/6. Co-ordinated research programmes on major subjects relating to uranium exploration and ore processing have been administered, together with a number of individual research contracts.

C.1.1/7. Six large-scale UNDP-financed uranium exploration projects – in Chile, Greece, Madagascar, Pakistan, Peru and Turkey – were administered and small-scale projects in a further 30 countries (financed either by UNDP or from the Agency's own technical assistance funds) were supervised; altogether 60 technical assistance projects were serviced and a large number of fellowship applications and reports were evaluated. Three regional or interregional training courses on uranium exploration were held: in 1975 (Austria), 1977 (Yugoslavia) and 1978 (United States of America).

Plans for 1981–82

C.1.1/8. A new NEA/IAEA "Uranium Resources, Production and Demand" report will be prepared and published in 1981 (Table C.7 No.1). The question of uranium resources will be further considered in 1982 (Table C.7, No.2).

C.1.1/9. The subject of uranium geology and mining in Africa will be reviewed and a report published (Table C.7, No.3).

C.1.1/10. A meeting on uranium deposits in Latin America will be held in connection with the VIIIth Argentina Geological Congress at San Luis in 1981. Reports and proceedings will be published by the Agency in 1982.

C.1.1/11. With the aid of consultants, an economic and technical evaluation will be made of uranium recovery from unconventional sources and uranium recovery by heap and in-situ leaching (Table C.7, No.4).

C.1.1/12. A Technical Report on uranium extraction technology and operation practice will be published in 1981 on the basis of data obtained from questionnaires completed by most of the uranium mills in the world. The report will be prepared with the aid of an NEA/IAEA Working Group.

C.1.1/13. In order to assist the planning of programmes for uranium exploration in new areas, especially in developing countries, a report of the IAEA Working Group on Uranium Geology will be prepared and published in 1981. It will take into account the main results on metallogenesis and uranium deposit formation obtained during meetings to be held at the 26th Geological Congress in Paris this year.

C.1.1/14. As little information is available on the most effective techniques for uranium exploration in wet tropical environments, a report based on the material presented at an Advisory Group meeting in Manila this year will be prepared and published in 1981.

C.1.1/15. Information on advanced technologies in uranium ore dressing and refining, and especially on methods to produce uranium concentrates of high quality directly in the ore-processing mill, will be compiled and issued as a report (Table C.7, No.5).

C 1 1/16. In order to help developing countries in uranium resource evaluation and exploration, INTURGEO will be expanded The first of a series of reports on the available information will be prepared in 1982 and published in 1983.

C 1.1/17. In order to help South American and African countries in the development of uranium resources, a report on the correlation of uranium geology between Africa and South America will be prepared and published (Table C.7, No.6).

C.1.1/18. The co-ordinated research programmes on factors controlling ore formation in sandstone-type uranium deposits and the study of granite rocks as a source of uranium (Table C.6, Nos. 1 and 2) will be continued.

Related activities

C.1.1/19. It is expected that further requests for large-scale technical assistance projects financed from UNDP funds will be received. It is also expected that the number of requests for technical assistance on a small scale from the Agency's own funds will be similar to that in 1979–80.

C.1.1/20. In view of the success of regional training courses on subjects related to uranium geology, exploration and evaluation, it is planned that one such course will be held each year in a different continent. For 1981, the course will be held in Madagascar.

Outline of changes during 1983–1986

C.1.1/21. The increased need for uranium, as well as for other minerals related to the nuclear industry, is expected to become more evident and will probably be reflected in a larger number of technical assistance requests.

Co-operation with other organizations

C.1.1/22. The dissemination of information on uranium resources involves co-operation with NEA, with the geology departments of national atomic energy commissions and with national and international geological and mining organizations; co-operation is also being maintained with the International Geological Correlation Programme (sponsored by UNESCO) and IIASA. Future co-operation is envisaged with CEC uranium resources groups, with IEA and with the Uranium Institute.

C.1.1/23. Where the provision of technical assistance to developing Member States is involved, co-operation will be maintained with UNDP, with the United Nations Revolving Fund for Natural Resources Exploration and the United Nations Centre for Natural Resources, Energy and Transport, with multinational-regional mineral resources centres, and also with the geology departments of national atomic energy commissions and with national geological and mining institutes.

## Reactor fuel technology, performance and reliability (component C.1.2)

Objective

C.1.2/1. The objective is to collect and evaluate technological information on the front end of the fuel cycle subsequent to conversion to "yellow-cake" and to study and evaluate already commercialized technologies and new processes; to collect, evaluate and provide for the exchange of information on water-reactor fuel element fabrication, with special emphasis on quality assurance and quality control, and on fuel element performance, behaviour and reliability; to advise developing countries on the establishment of fuel element fabrication facilities and the evaluation of the reliability and safety of fuel elements during operation in the reactor core; and to collect and evaluate research and development information on advanced fuels for different types of reactors, including manufacturing technology, performance and reliability.

Results to date

C.1.2/2. In the field of uranium conversion and isotope separation, a consultants' meeting on actinide separation was held in 1979 to discuss a series of publications on actinide chemistry and separation. Activities on uranium refining technologies have been continued since 1977. A research contract on laser spectroscopy of uranium and its compounds has been initiated.

C.1.2/3. The status of water-reactor fuel technology in different countries has been reviewed at meetings of the International Working Group on Water-Reactor Fuel Performance and Technology (IWGFPT), established in 1976, and recommendations for action by the Agency in these areas have been made.

C.1.2/4. Six specialists' meetings were organized during 1977–79 on fuel element reliability and performance; an evaluation of the state-of-the-art and recommendations for future activities were issued in the same period.

C.1.2/5. Two seminars in the field of quality assurance and quality control for fuel fabrication were organized in Norway and Argentina during 1976 and 1979 respectively and recommendations for Member States were prepared.

C.1.2/6. A consultants' meeting on advanced fuel technology and performance was held in 1979 and recommendations for the Agency's activities in this field were made. Questionnaires have been prepared and will be sent to Member States in order to survey the experience in spherical particle and carbide-type fuel technology.

Plans for 1981–82

C.1.2/7. Information will be collected and reported on the status of development of uranium conversion and isotope separation technologies and on the supply of and demand for enriched uranium, including aspects relating to non-proliferation. A status review on the subject will be prepared with the help of consultants (Table C.7, No.7).

C.1.2/8. The collection, evaluation, dissemination and exchange of information on water-reactor fuel technology and performance will continue with the emphasis on safety aspects (Table C.7, No.8).

C.1.2/9. A report on high burn-up in power water-reactor fuels, containing recommendations and listing the consequences of increased burn-ups, will be prepared (Table C.7, No.9).

C.1.2/10. Recommendations on post-irradiation examination (PIE) techniques will be published (Table C.7, No.10).

C.1.2/11. Reports on fuel element reliability and the safety aspects of fuel element behaviour and on the improvement of water-reactor fuel utilization will be published to assist Member States with these problems (Table C.7, Nos. 11 and 12).

C 1.2/12. The activities described in paragraphs C.1.2/8–11 above will be carried out within the framework of IWGFPT.

C.1.2/13. Research on cladding interaction with water coolant and the water chemistry in power reactors will continue under a co-ordinated research programme planned to start in 1981. Recommendation on measures to prevent fuel element cladding failures due to corrosion will be made with the aid of consultants (Table C.7, No.13).

C.1.2/14. A report on improved fuel technology, with special reference to the closing of the carbide fuel cycle, will be prepared (Table C.7, No.14).

C.1.2/15. An exchange of information will be started on questions related to sphere-pack and carbide-type fuels and core structural materials. With the help of consultants, a report on advanced reactor fuels and materials will be produced; it will include an assessment on the use of ferritic steels in fast reactors (Table C.7, No.15).

Related activities

C.1.2/16. Support for Agency technical assistance projects, including projects being executed on behalf of UNDP, will continue to be provided.

Outline of changes during 1983–86

C.1.2/17. Attention will be paid to the advances in chemical treatment and separation technologies for uranium conversion, purification and enrichment.

C.1.2/18. Activities will be centred on the preparation of guidebooks and manuals on fuel element reliability, safety problems and improved fuel utilization. Special attention will be paid to advanced fuel elements.

Co-operation with other organizations

C.1.2/19. Co-operation with NEA, CEC and IEA will continue.

Spent fuel management (component C.1.3)

Objective

C 1.3/1. The objective is to assist interested Member States in technical matters involving the management of spent fuel from various types of reactors by collecting, evaluating and exchanging information on the back-end of the fuel cycle and specifically on short-, medium-, and long-term storage options and transportation, reprocessing and recycling techniques; and to provide assistance in international studies such as those on international plutonium storage, international spent fuel management and multinational fuel cycle centres.

Results to date

C.1.3/2. The main activities on spent fuel management were related to the study of regional nuclear fuel cycle centres (RNFCCs, 1975–1977) and INFCE (1978–80).

C.1.3/3. The continued uncertainties about the reprocessing and re-cycling policies of various Member States have resulted in a situation where the Agency simply monitors developments and changes in the relevant technologies.

C.1.3/4. Major technical assistance was given to six Member States through UNDP projects and the Agency's regular programme. This activity expanded in response to demand during the years 1976–80.

C.1.3/5. The Agency's spent fuel management activities have led to co-operation with NEA in research into the effects on spent fuel elements of long-term storage in water.

C.1.3/6. In 1978 an NEA/IAEA symposium was organized on the economic and safety aspects of spent fuel storage techniques.

Plans for 1981–82

C 1.3/7. Interest by Member States has led to the establishment of a programme to evaluate alternative storage technologies for spent fuel. A meeting will be held to discuss the various alternatives in order to produce a report on the status of the various technologies (Table C.7, No.16) and a guidebook on spent fuel storage management will be prepared (Table C.7, No.17).

C 1.3/8. With the help of consultants, a review will be made of the various reprocessing technologies, including (if sufficient interest is shown) uranium-plutonium fuel element reprocessing, co-processing, direct mixed oxide manufacture and the pre-irradiation of fuel elements (Table C.7, No.18).

C.1.3/9. The joint research co-ordination effort with NEA on monitoring the behaviour of spent fuel and related equipment during extended storage in water-filled basins will continue. Periodic status reports will be produced.

C.1.3/10. Technical support will be provided for international plutonium storage and the management of spent fuel.

Related activities

C.1.3/11. Support for Agency technical assistance projects, including projects being executed by the Agency on behalf of UNDP, will continue to be provided.

C.1.3/12. Assistance will be made available to Member States interested in establishing regional or multinational fuel cycle centres.

Outline of changes during 1983–86

C.1.3/13. The changes in spent fuel management activities will depend upon post-INFCE reviews and the attitude of Member States to the subject of reprocessing and plutonium recycling. A review of the safety aspects of reprocessing technology and storage will be made.

Co-operation with other organizations

C.1.3/14. Co-operation with NEA, CEC and IEA will continue.

## SUB-PROGRAMME C.2

### Waste management

OBJECTIVE

C.2/1. The objective is to review and disseminate information and develop guidance for Member States on the safe management of radioactive wastes in order to ensure the protection of man and his environment. This will include in particular: (a) the safe handling, treatment, conditioning and disposal of radioactive wastes arising from the peaceful use of nuclear energy, with emphasis on the nuclear fuel cycle, the safe underground disposal of radioactive wastes and techniques for maintaining radionuclide releases at acceptable levels; and (b) the environmental transfer of radionuclides and associated contaminants to man and the evaluation of the impact of their actual or potential release to the environment.

OUTLINE FOR 1981–86

C.2/2. The Agency will continue to provide a forum for the exchange of information on the safe management and disposal of radioactive wastes and for discussing the needs of Member States in those areas and to encourage research which will be useful for waste management and environmental assessment purposes. Information on technology and the state of the art will be disseminated through symposia, technical meetings, reports and advisory missions. Emphasis will be placed on the formulation of guidance for the handling, treatment and conditioning of radioactive wastes for underground disposal.

C.2/3. The programme on the handling and treatment of radioactive wastes, given major attention during the 1960s and 1970s, is expected to continue during the 1980s at a significant level but with changing emphasis. Whereas high-level waste treatment has been emphasized during recent years, the technologies for handling, treating and conditioning low-intermediate-level wastes will now receive equal stress. The conditioning of wastes prior to their disposal will be the principal focus of attention. Treatment of gaseous effluents and wastes will continue to require significant effort. A number of documents on waste treatment prepared during the 1960s are being reviewed, and updated versions will be issued. Co-ordinated research programmes will be introduced to meet current needs, in particular those of developing countries.

C.2/4. The programme for the safe underground disposal of radioactive wastes, initiated in 1977, will continue to cover the following major subjects: regulatory activities and safety assessment; siting; waste acceptance criteria; and the design, construction, operation and shutdown of repositories. A number of documents on these subjects prepared in 1978–80 will be published in 1981–82. Further documents will be prepared during the period up to 1984. Some of these will then be re-examined during 1983–86 in the light of experience with a view to their being revised and issued as codes and guides.

C.2/5. Activities will include continuing environmental studies carried out with a view to setting limits for radionuclides released into the environment from nuclear facilities. The studies will involve both terrestrial and marine ecosystems and include both regional and global aspects. Continued attention will be paid to the Agency's responsibilities under international conventions for protection of the environment.

## STRUCTURE

C.2/6. This sub-programme consists of three components, which are described in the following paragraphs.

### Waste management

Summary by programme components

Table C.5

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Handling and treatment of radioactive wastes | 3.7 | 2.4 | 360 100 | 107 000 | 64 000 | 16 900 | 548 000 |
| Underground disposal of radioactive wastes | 3.5 | 2.3 | 354 300 | 104 000 | 16 000 | 17 700 | 492 000 |
| Environmental aspects of the nuclear fuel cycle | 3.8 | 2.3 | 345 800 | 129 000 | 50 000 | 22 200 | 547 000 |
| Linguistic services | – | – | – | – | – | 46 000 | 46 000 |
| Printing and publishing services | – | – | – | – | – | 245 000 | 245 000 |
| Conference services | – | – | – | – | – | 53 000 | 53 000 |
| TOTAL | 11.0 | 7.0 | 1 060 200 | 340 000 | 130 000 | 400 800 | 1 931 000 |

### Handling and treatment of radioactive wastes (component C.2.1)

Objective

C.2.1/1. The objective is to review, disseminate and promote the exchange of information on the relevant technology and to develop guidance for the safe handling and treatment of radioactive wastes at nuclear facilities so as to ensure that releases of radionuclides into the environment are minimized and that wastes are reduced in volume and appropriately conditioned for storage and/or disposal. The areas covered include the management of: waste from the mining and milling of uranium and thorium ores; low-intermediate-level solid waste; liquid and gaseous effluents and waste; high-level and alpha-bearing waste; and waste from decontamination and decommissioning.

Results to date

C.2.1/2. This component continued earlier activities which were concerned mainly with the principles and technology for the treatment of low-intermediate level radioactive waste and with the dissemination of information in these areas to Member States. During 1975–80, emphasis has been placed on the treatment of high-level radioactive waste, the management of waste at nuclear power stations and the decommissioning of nuclear facilities. The latter subject constituted a separate programme component during 1975–80.

C.2.1/3. In 1976, at a symposium organized by the Agency and NEA, the current situation regarding the management of radioactive wastes generated by the major types of nuclear fuel cycle facilities was reviewed. Radioactive waste management and effluent control were also included in the programme of the Salzburg Conference in 1977.

C.2.1/4. Information on the management of high-level and alpha-bearing wastes was exchanged at Technical Committee meetings in 1974, 1975, 1976, 1977 and 1979. This year, at a symposium held in June by the Agency and CEC on the management of alpha-contaminated waste, progress in this area was reviewed. Technical documents were

published in 1977 and 1979 on the handling and storage of high-level liquid radioactive waste requiring cooling, techniques for the solidification of high-level waste and the characteristics of solidified high-level waste forms (Technical Reports Series Nos. 191, 176 and 187). Work relating to the evaluation of solidified high-level waste forms and the assessment of the separation of actinides from high-level waste followed by either transmutation or separate disposal has been carried out under co-ordinated research programmes (Table C.6. Nos. 4 and 5).

C.2.1/5. A code of practice on the management of waste from the mining and milling of uranium and thorium ores was published in 1976 (Safety Series No. 44). Documents on current practices and options for the stabilization of uranium mill tailings and on the management of waste from the refining and conversion of uranium ore concentrates to uranium-hexafluoride have been in preparation and will be published in 1981.

C.2.1/6. Activities relating to waste management at nuclear power plants resulted in the publication in 1979 and 1980 of technical guidance on the safe storage, handling and movement of fuels and related components at nuclear power plants and on the safe handling of radioactive wastes at nuclear power plants (Technical Reports Series No. 189). Other subjects considered by Technical Committees included the decontamination of operating nuclear facilities (1979), the handling of tritium-bearing waste (1978) and the treatment of spent ion-exchange resins, the last two subjects resulting in the initiation of co-ordinated research programmes (Table C.6, Nos. 8 and 9). Previous Agency reports on the volume reduction of solid waste and the bituminization and treatment of low-intermediate level waste concentrates (Technical Reports Series Nos. 106, 82, 116) were reviewed and updated during 1979–80.

C.2.1/7. The management of gaseous radioactive waste from nuclear facilities was considered by Technical Committees in 1977, 1978 and 1979, and by an IAEA/NEA symposium in 1980. Technical reports were prepared on the retention, storage and disposal of gaseous radionuclides in airborne effluents from nuclear facilities, on methods and techniques for radioiodine control in nuclear facilities and on the handling of tritium-bearing waste; they will be issued in 1980 and 1981. The retention of gaseous radionuclides from nuclear power plants under normal and accident conditions was reviewed at two expert meetings in 1979 and 1980 and will be subject of a technical report to be issued in 1981. Methods for testing particulate filters have been investigated within a co-ordinated research programme (Table C.6. No 6) which is expected to terminate in 1981.

C.2.1/8. A joint IAEA/NEA symposium was held in 1978 on the decommissioning of nuclear facilities, and panel meetings were convened in 1975, 1977 and 1978 to develop a code of practice and guide on this subject. After consideration of existing experience and its relevance to the on-going NUSS programme (see programme component C.3.1), the information was prepared for publication in 1980 under the title "Factors Relevant to Decommissioning of Land Based Nuclear Reactor Plants".

Plans for 1981–82

C.2.1/9. Work will continue on reviewing documentation on the technology for the treatment of low-intermediate level liquid and solid waste with a view to ensuring that releases can be kept well below acceptable limits and waste volumes can be reduced effectively. The revision of Technical Reports Series Nos 82, 106 and 116, on the treatment of waste concentrates, bituminization and the volume reduction of solid waste, will be completed. Earlier publications on liquid waste treatment (Technical Reports Series Nos. 78, 87, 89) will be updated and amended. These revisions will result in three technical documents dealing with: (a) techniques for the conditioning of low-intermediate level radioactive waste concentrates (to be issued in 1981); (b) the treatment of solid low-intermediate level radioactive wastes (to be issued in 1981); and (c) the treatment of liquid low-intermediate level wastes (Table C.7, No.19). Further investigations will be made through co-ordinated research programmes (Table C.6, Nos. 8 and 9) of the treatment of spent ion-exchange resins and $^{3}H$-contaminated wastes and effluents and a review will be prepared on the handling of specific intermediate level waste forms (Table C.7, No.20). The preparation of a code of practice on the safe management of radioactive waste from thermal nuclear power plants will be initiated (Table C.7, No.21).

C.2.1/10. Emphasis will be placed on the handling and conditioning of low-intermediate and high-level waste with regard to their safe storage, transportation and disposal. Information on new developments in this area will be exchanged at a symposium in 1982 (Annex II (3)), which may be organized in co-operation with other international organizations. The techniques and requirements for the handling, interim storage and transportation of low-intermediate level wastes prior to and after conditioning (Table C.7, No.22) will be reviewed. The interim storage, handling and transportation of conditioned high-level waste, including spent fuel elements intended for disposal, will also be reviewed in depth (Table C.7, No.23). The conditioning requirements for storage, transportation and underground disposal of radioactive waste from nuclear power plants will be considered (Table C.7, No.24) with a view to initiating the preparation of

acceptance criteria (see para. C.2.2/8). Investigations into the characteristics of solidified high-level and transuranics-bearing wastes, new immobilization methods and aspects of actinide separation will be reviewed and continued as appropriate through co-ordinated research programmes (Table C.6, Nos. 5 and 4).

C.2.1/11. Gaseous effluent and waste treatment will be of continuing importance in protecting the environment from airborne releases under both normal and accident conditions, and work will concentrate on reviewing methods and procedures for the testing and in-plant monitoring of off-gas cleaning systems (Table C.7, No.25) and the experience of and requirements for the operation of off-gas cleaning systems at nuclear facilities (Topical Seminar – Annex II (4)). Subsequently, guidelines on the testing and in-plant monitoring of particulate filters and on the operation of off-gas cleaning systems at nuclear facilities will be developed (Table C.7, Nos. 26 and 27).

C.2.1/12. Continuing consideration will be given to the management and disposal of waste from uranium and thorium mining and milling with emphasis on mill tailings, including long-term aspects. A symposium on the subject is planned for 1982 in co-operation with NEA (Annex II (5)). Thereafter, the review of the existing code of practice issued in 1976 (Safety Series No.44) and the preparation of related guides will be initiated (Table C.7, No.28).

C.2.1/13. In 1982, there will be a review and exchange of information on methods and techniques for decontamination and decommissioning at nuclear facilities and the management of waste resulting from these activities (Table C.7, No.29).

C.2.1/14. Guidance and other assistance will be provided in connection with waste management problems of individual Member States, account being taken of the special requirements for countries with developing nuclear power programmes. A regional seminar on the management of radioactive waste from nuclear power stations is planned for 1981 (Annex I (2)).

Outline of changes during 1983–86

C.2.1/15. The preparation of guidance (which eventually will take the form of codes and guides) for the design and operation of waste treatment and storage facilities, waste classification, and the management of both radioactive and non-radioactive wastes from selected nuclear facilities will continue. Emphasis will be placed on updating and supplementing the publications concerning waste management technology which were issued before 1977 in the Agency's Safety Series and Technical Reports Series.

C.2.1/16. The handling and storage of alpha-contaminated waste, high-level waste from the reprocessing of irradiated fuel and specific intermediate level waste will be given increasing attention with a view to the recommendation of suitable technologies. A review will be made of the technology involved in the processing of plutonium-containing waste (scrap) for the recovery of the plutonium.

C.2.1/17. The waste management implications of both present and future fission reactor types (especially the potential impact of fast breeders on waste management activities and on the overall fuel cycle) will be studied and compared. In this connection, consideration will also be given to the waste management implications of fusion reactors.

C.2.1/18. With regard to radioactive gaseous and liquid discharges from nuclear facilities, as well as the conditioning and interim storage of waste, continuing efforts will be made to secure international co-operation in the harmonization of principles and in the review of national policies.

Co-operation with other organizations

C.2.1/19. This component involves co-operation with ECE, UNEP, NEA, CEC and CMEA.

## Underground disposal of radioactive wastes (component C.2.2)

Objective

C.2.2/1. The objective is to develop acceptable guidelines for the safe underground disposal of radioactive wastes, ranging from deep geological disposal to disposal at shallow depths; to collect, review and disseminate technical and

regulatory information; and to encourage the development of technology for the safe underground disposal of radioactive wastes.

Results to date

C.2.2/2. This activity was initiated in 1977. The first step was the co-ordination of all related work into a coherent plan on the basis of recommendations made by consultants in 1977 and an Advisory Group in 1978 about the future of the Agency programme on the underground disposal of radioactive waste. As a result, a Technical Review Committee was established in 1978 to make recommendations on the scope of the documents to be produced under this programme, to review and comment on all documents prepared for publication and to give advice about the programme, which now covers the general techniques for underground disposal (shallow ground, rock caverns, deep geological, deep-well injection of liquids and hydraulic fracturing) as well as detailed problems associated with the individual methods (regulatory activities and safety assessment, siting, waste acceptance, design and construction, and operation shutdown and surveillance of repositories).

C.2.2/3. The first product was Technical Reports Series No. 177, "Site Selection Factors for Repositories of Solid High-Level and Alpha-Bearing Wastes in Geological Formations", published in 1977. The second report, published in the Safety Series (No.51) this year, was "Development of Regulatory Procedures for the Disposal of Solid Radioactive Waste in Deep, Continental, Geological Formations". Also prepared for publication this year are the Safety Series reports "Basic Guidance on Underground Disposal" and "Guide to Shallow Ground Disposal of Radioactive Waste". Under preparation for publication in 1981 are reports on: safety assessment methodology for underground disposal; safety assessment for disposal into deep geological repositories; site investigations for repositories in deep, continental, geological formations; and site investigations for repositories in shallow ground.

C.2.2/4. A symposium on the underground disposal of radioactive wastes, sponsored jointly with the NEA, was held at Otaniemi, Finland, in 1979.

Plans for 1981–82

C.2.2/5. The emphasis will be on the disposal of low- and intermediate-level wastes in shallow ground and in rock caverns, with continuing work also on other disposal techniques. Reviews of the Agency's documents and activities will be made in 1981 and 1982 (Table C.7, No 30).

C.2.2/6. A Safety Series document on basic criteria for underground disposal will be prepared for publication (Table C.7, No.31). A Technical Report will be produced on safety analysis for disposal of solid wastes in shallow ground and rock caverns (Table C.7, No.32). In addition, Safety Series documents with guidance for disposal in rock caverns (Table C.7, No.33) and on the application of radiological protection standards to underground disposal will be prepared (Table C.7, No.34). Regulatory activities will continue with the development of recommendations on the regulation of underground disposal (Table C.7, No.35).

C.2.2/7. Publications on site investigations and site selection for underground disposal facilities will reach a peak during 1981–82. Technical Reports on "Site Investigations for Repositories in Deep, Continental, Geological Formations" and on "Site Investigations for Repositories in Shallow Ground" will be issued in 1981. In addition, a report on solid waste disposal in rock caverns and two reports on site investigations for fluid waste disposal in deep geological formations will be completed (Table C.7, Nos. 36–38). Consideration will be given to initiating the preparation of a code on the siting of underground repositories.

C.2.2/8. The preparation of a report on waste acceptance criteria for disposal by each of the basic underground disposal techniques, together with the conditioning requirements for storage and transportation, will be initiated (Table C.7, No.24). (See also para. C.2.1/10).

C.2.2/9. A Safety Series document on the design and construction of shallow ground repositories will be finalized for publication in 1983 (Table C.7, No.39). A parallel report on disposal in rock caverns will also be prepared (Table C.7, No.40).

C.2.2/10. A Safety Series document on the operation, shutdown and surveillance of shallow ground repositories will be completed (Table C.7, No.41) and the preparation of a parallel report on the operation, shutdown and surveillance of repositories in rock caverns will be initiated (Table C.7, No.42).

C.2.2/11. Information on the effects of heat and radiation from radioactive waste on underground disposal systems will be collected and reviewed (Table C.7, No.43). A symposium (Annex I (3)) will be held in 1981 on migration in the terrestrial environment of long-lived radioisotopes from the nuclear fuel cycle (see also para. C.2.3/11).

Outline of changes during 1983–86

C.2.2/12. Underground disposal activities in 1983–86 will emphasize waste acceptance criteria, the design and construction of repositories, and the operation, shutdown and surveillance of the respective disposal schemes.

C.2.2/13. General and safety analysis activities will be completed for underground disposal, with consideration given to the preparation of related codes and guides. Regulatory procedures will be published for disposal into shallow ground, rock caverns and deep permeable formations, and by hydraulic fracturing. It is planned to start the preparation of a code on the regulation of underground disposal. Consideration will be given to the possibility of using earlier reports as a basis for the preparation of a number of codes and related guides.

C.2.2./14. Waste acceptance criteria will be published for the various basic underground disposal techniques. Reports will be prepared on the design and construction of underground disposal repositories for the five basic techniques and on the operation, shutdown and surveillance of the various types of repository.

C.2.2/15. Symposia are planned on site investigations for underground waste disposal, safety assessments for underground waste disposal and the design and construction of underground repositories. Consideration will be given to co-sponsorship of these symposia with other international organizations.

Co-operation with other organizations

C.2.2/16. Consultations and co-operation with NEA, CEC, UNEP and CMEA will continue.

## Environmental aspects of nuclear energy (component C.2.3)

Objective

C.2.3/1. The objectives of this programme are to collect, review and encourage the development of data and models related to the environmental dispersion and behaviour of radionuclide releases; to establish methodologies for assessing the comparative environmental impacts of radiological and other effects of actual and potential radioactive and other releases from nuclear and non-nuclear facilities; to keep under review the Agency's Definition and Recommendations for the London Dumping Convention; and to discharge the Agency's responsibilities under other conventions for protection of the environment.

Results to date

C.2.3/2. This component was initiated in 1972. Since then, many technical documents have been published on the results of symposia, seminars, and Advisory Group and Technical Committee meetings. An Advisory Group met in 1979 to review the Agency's overall environmental programme.

C.2.3/3. The environmental behaviour of certain important radionuclides has been reviewed and the findings published. A symposium on tritium in the environment was held in 1978. The results of a co-ordinated research programme on this subject, entitled "Tritium in Some Typical Ecosystems", will be published in 1980. Further aspects remain to be studied. Another co-ordinated research programme (Table C.6, No.3) will result in the publication, after its termination in 1981, of a report on the behaviour of radium in aquifers and waterways.

C.2.3/4. Information on the local, regional and global impacts of radioactive, thermal and other releases from nuclear activities has been exchanged (Technical Committee in 1976) and the environmental pathways of radionuclides assessed (Technical Committee 1978, Advisory Group 1980). The results are being prepared for a publication in 1981 in a report on basic models for predicting the environmental transfer of radionuclides to man.

C.2.3/5. The Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter (the London Dumping Convention), gave the Agency the responsibility of defining criteria and making recommendations for protecting the marine environment in case of dumping of radioactive wastes and other radioactive matter at sea. The first consultative meeting (1976) of the contracting parties to the London Dumping Convention accepted the Agency's "Provisional Definition and Recommendations". During 1976–78, the Agency convened several meetings for the purpose of reviewing and updating the oceanographic and the radiological basis of the document. At the fourth consultative meeting of the contracting parties, in October 1978, the Agency's "Revised Definition and Recommendations" were formally accepted, and they are now operative under the Convention.

C.2.3/6. Guidance to Member States was considered at an Advisory Group meeting in 1978 on criteria for the selection, management and surveillance of ocean dumping sites. A publication on this subject is being prepared and will be issued in 1981. In addition, the problems of establishing de minimis radioactive additions to coastal environments and requirements for packaging radioactive wastes for ocean dumping have been reviewed.

C.2.3/7. A current revision (1980) of Safety Series No.5 (first issued in 1961) summarizes the important aspects a Member State should consider when disposing of low-level radioactive wastes either as a liquid effluent into the coastal zone or as packaged solid waste into the deep sea.

C.2.3/8. Efforts have gone into encouraging the collection of basic data and the development of methodology for assessing impacts of radioactivity on aquatic ecosystems (Technical Reports Series No.190, 1979). In addition, two co-ordinated research programmes, on transuranic cycling behaviour in marine environments and the migration and dispersion of radionuclides from radioactive wastes in the terrestrial environment, have been initiated (Table C.6, Nos.10 and 7).

C.2.3/9. In co-operation with UNEP, attention has been given to comparisons of the environmental impacts of nuclear energy and other energy sources. A previous publication on nuclear power and the environment has been updated and prepared for publication.

Plans for 1981–82

C.2.3/10. In view of the recommendations of the 1979 Advisory Group, efforts will continue on reviewing and developing methodologies and data, and on assessing the environmental impact of nuclear fuel cycle facilities (including the beneficial aspects of thermal releases). In particular, the transfer of radionuclide releases of regional and world-wide significance, especially through atmospheric pathways, will be considered (Table C.7, No.44) and the relevant models and radiological basis examined for the eventual preparation of a Safety Series document (Table C.7, No.45). Information on atmospheric dispersion models will be compiled and reviewed (Table C.7, No.46).

C.2.3/11. Work will also continue on the review and verification of data and models related to the transfer of radionuclides through aquatic and terrestrial pathways to man. Information on new data and developments concerning the migration of long-lived radioisotopes from the nuclear fuel cycle in the terrestrial environment will be exchanged at a symposium in 1981 (Annex I (3)).

C.2.3/12. Within the framework of a co-ordinated research programme, studies will be carried out on the behaviour of carbon-14 in the environment (Table C.6, No.11). The existing co-ordinated research programme on the behaviour of radium in inland waterways and aquifers (Table C.6, No.3) will terminate in 1981/82, and a programme dealing also with other natural radionuclides of radiological significance will be initiated.

C.2.3/13. As a first step towards preparing a safety document, consideration will be given to defining de minimis limits for the release of very low-level solid radioactive waste from nuclear activities into terrestrial environments (Table C.7, No.47). Research activities on the dispersion of radionuclides from radioactive wastes in the terrestrial environment will continue (Table C.6, No.7).

C.2.3/14. Continuing attention will be given to the comparison of environmental impacts of nuclear energy and other energy sources mainly within the framework of the Agency's co-operation with UNEP on the assessment of environmental constraints of various energy sources.

C.2.3/15. The Agency will continue to discharge its responsibilities under the London Dumping Convention and under other conventions and protocols for protection of the marine environment, including the protection of seas from

land-based sources of radioactive pollutants. The programme may be adjusted on the basis of the results of an international symposium on the impact of radionuclide releases in the marine environment to be held this year. The oceanographic model underlying the Agency's Definition and Recommendations will be reviewed on the basis of the findings of GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Pollution) (Table C.7, No.48). Similarly, the radiological basis will be subject to review in 1982 (Table C.7, No.49).

C.2.3/16. Following the guidelines on site selection, surveillance and packaging developed during 1979–80, the preparation of guidance on the following topics will be initiated: (a) the definition of de minimis quantities exempted from special permits in the case of dumping at sea (Table C.7, No.50); (b) environmental assessment of dumping operations (Table C.7, No.51); (c) assessment of dumping versus underground disposal (Table C.7, No.52). A revision of the Agency's current Definition and Recommendations will be started on the basis of the findings.

C.2.3/17. Studies will continue on the physical, physico-chemical and biological processes involved in the transfer of radionuclides through the marine environment to man, as related to aspects of the deep-ocean dumping of radioactive waste (Table C.6, No.10) and the environmental assessment of selected regional seas. This will be done in co-operation with the Monaco Laboratory.

C.2.3/18. Guidance and other assistance regarding environmental assessments will be provided to Member States as needed.

Outline of changes during 1983–86

C.2.3/19. Analyses will be undertaken of the environmental impact of long-lived radionuclides with regional and global significance and of advanced reactor concepts and related variations of the nuclear fuel cycle.

C.2.3/20. The Agency's Definition and Recommendations for the London Dumping Convention will be reviewed during 1983–86.

Co-operation with other organizations

C.2.3/21. The Agency's environmental programme involves co-operation in the sponsoring of meetings and the publication of reports with many intergovernmental and non-governmental organizations, especially those within the United Nations system such as UNEP, UNSCEAR, IMCO, GESAMP, FAO, WHO and WMO. There is also considerable interaction with NEA and CEC.

## Co-ordinated research programmes

Table C.6

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Factors controlling ore formation in sandstone-type uranium deposits | 4 | 2 | 1976 | 1981 |
| 2. Study of granitic rocks as a source of uranium | This programme has been approved but no contract has yet been awarded. | | | |
| 3. Studies on the source, distribution, movement and deposition of radium in inland waterways and aquifers | 4 | 5 | 1975 | 1981 |
| 4. Environmental evaluation and hazard assessment of the separation of the actinides from the high-level waste from fuel reprocessing followed by either transmutation or separate disposal | – | 7 | 1976 | 1980 |
| 5. Evaluation of solidified high-level waste products | – | 10 | 1977 | 1982 |
| 6. Methods for testing particulate filters | 2 | 2 | 1977 | 1981 |
| 7. Migration and dispersion of radionuclides from the storage of radioactive wastes under various conditions in the terrestrial environment | 4 | 5 | 1978 | 1981 |
| 8. Handling tritium-contaminated effluents and wastes | – | 4 | 1978 | 1981 |
| 9. Treatment of spent ion-exchange resins | – | 5 | 1978 | 1981 |
| 10. Transuranic cycling behaviour in marine environment | 7 | 8 | 1978 | 1981 |
| 11. Carbon-14 from nuclear facilities | This programme has been approved but no contract has yet been awarded | | | |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table C.7

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | NEA/IAEA Report on Uranium Resources, Production and Demand (published by NEA) | Uranium producers and consumers, AECs, Ministries of Energy and/or Mines (MEM) | TC 1981/1 | 1981 | C.1.1/8 |
| 2 | Interim report on uranium resources | As above | TC 1982/1 | 1982 | C.1.1/8 |
| 3 | Technical Report on geology and mining in Africa | Uranium exploration and producing companies, AECs, MEMs of African countries | TC 1981/2 | 1982 | C.1.1/9 |
| 4 | Technical Report on uranium recovery from unconventional sources and by heap and in-situ leaching | Uranium exploration and producing companies, AECs and MEMs, especially of developing countries | Consultants' meeting in 1981 | 1982 | C.1.1/11 |
| 5 | Technical Report on uranium ore dressing and refining | Member States, organizations or companies interested in uranium production | TC 1982/2 | 1983 | C.1.1/15 |
| 6 | Technical Report on correlation between uranium geology of Africa and South America | Governments, organizations and companies of Africa and South America interested in the development and production of uranium resources | Consultants' meeting in 1981 | 1981 | C.1.1/17 |
| 7 | IAEA-TECDOC on the status of conversion and isotope separation with recommendations to Member States | Agency Secretariat, Member States developing nuclear technology | Consultants' meetings in 1981 and 1982 | 1981<br>1982 | C.1.2/7 |
| 8 | Report of IWGFPT containing programme of work and recommendations for Agency activities in the area of water reactor fuel technology for 1981–83 | Agency Secretariat and Member States of the Agency with power reactors or nuclear development programmes | TC 1981/3 | 1981 | C.1.2/8 |
| 9 | Technical Report with recommendations on high burn-up of power water reactor fuels | Agency Secretariat, member countries of IWGFPT for use in work on fuel performance and technology | Specialists' meeting 1981/4 | 1981 | C.1.2/9 |
| 10 | Technical Report on examination of power reactor fuel assemblies with recommendations on PIE techniques | As above | Specialists' meeting 1981/5 | 1982 | C.1.2/10 |
| 11 | Technical Report on fuel element reliability and safety aspects of fuel element behaviour | As above | Specialists' meeting 1982/3 | 1982 | C.1.2/11 |
| 12 | Technical Report on improved water-reactor fuel utilization | As above | Specialists' meeting 1982/4 | 1982 | C.1.2/11 |
| 13 | Technical Report on behaviour of cladding materials under reactor conditions | Member States, nuclear power plants operators and designers | Consultants' meering in 1981 | 1982 | C.1.2/13 |
| 14 | IAEA-TECDOC on improved fuel technology and performance | Agency Secretariat and Member States developing advanced reactor concepts | Specialists' meeting 1981/6 | 1981 | C.1.2/14 |
| 15 | IAEA-TECDOC on advanced reactor fuels and materials | As above | Consultants' meeting in 1981 | 1982 | C.1.2/15 |
| 16 | Technical Report on the development of various spent fuel storage technologies | Nuclear power reactor operators, Ministries of Atomic Energy | Consultant's meeting in 1981 | 1981 | C.1.3/7 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 17 | Guidebook on spent fuel storage management | As above | Consultants' meeting in 1981 | 1981 | C.1.3/7 |
| 18 | IAEA-TECDOC on the status of selected technologies in reprocessing, with recommendations for future Agency programme | Agency Secretariat | Consultants' meeting in 1982 | 1982 | C.1.3/8 |
| 19 | Technical Report on treatment of low-intermediate level liquid wastes | Ministries of Health, Technology and Science, nuclear facility designers and operators and national regulatory bodies | TC 1981/7<br>AG 1982/5 | 1982 | C.2.1/9 |
| 20 | Technical Report on management of intermediate level waste components from nuclear facilities | As above | TC 1982/6 | 1983 | C.2.1/9 |
| 21 | Safety Series Code of Practice on the management of radioactive waste from thermal nuclear power stations | As above | AG 1982/7<br>Submission to Board in 1982 | 1983 | C.2.1/9 |
| 22 | Technical Report on techniques for handling, interim storage and transport of low-intermediate level waste prior to and after conditioning | As above | TC 1981/8 | 1983 | C.2.1/10 |
| 23 | Technical Report on interim storage and techniques for handling conditioned high-level waste | As above | TC 1981/9 | 1983 | C.2.1/10 |
| 24 | Report on conditioning requirements of radioactive waste from nuclear power plants for storage and underground disposal (For eventual incorporation in a Safety Series document) | Agency Secretariat | AG 1982/8 | 1982 | C.2.1/10 |
| 25 | Technical Report on testing and in-plant monitoring of off-gas cleaning systems at nuclear facilities | Ministries of Health, Technology and Science, nuclear facility designers and operators and national regulatory bodies | TC 1981/10 | 1983 | C.2.1/11 |
| 26 | Safety Series Recommendations on testing of particulate filters | As above | AG 1982/9 | 1983 | C.2.1/11 |
| 27 | Safety Series Recommendations on operation of off-gas cleaning systems at nuclear facilities | As above | AG 1982/10 | 1983 | C.2.1/11 |
| 28 | Revision of Safety Series, Code of Practice on the Management of Wastes from the Mining and Milling of Uranium and Thorium Ores | As above | AG 1982/11<br>Submission to Board in 1983 | 1984 | C.2.1/12 |
| 29 | Technical Report on techniques for decontaminating nuclear facilities and the management of waste from decontamination and decommissioning activities | As above | TC 1982/12 | 1983 | C.2.1/13 |
| 30 | Review of documents and activities within the underground disposal programme | Secretariat | TC 1981/11<br>TC 1982/13 | 1982/82 | C.2.2/5 |
| 31 | Safety Series, Recommendations on Basic Criteria for Underground Disposal of Radioactive Wastes | National regulatory bodies, technical and administrative personnel responsible for national radioactive waste management programmes and international bodies concerned with this subject | AG 1981/12<br>AG 1982/14 | 1983 | C.2.2/6 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 32 | Technical Report on safety analysis for disposal of radioactive waste in shallow ground and rock caverns | As above | AG 1981/13 | 1982 | C.2.2/6 |
| 33 | Safety Series Recommendations on disposal of radioactive waste into rock caverns | As above | AG 1981/14 | 1982 | C.2.2/6 |
| 34 | Safety Series Recommendations on application of radiological protection standards to underground disposal of radioactive waste | As above | AG 1981/15 | 1983 | C.2.2/6 |
| 35 | Safety Series Recommendations on the regulation of underground disposal | As above | AG 1982/15 | 1983 | C.2.2/6 |
| 36 | Technical Report on site investigation for radioactive waste repositories in rock caverns | As above | AG 1981/16 | 1982 | C.2.2/7 |
| 37 | Technical Report on site investigations for disposal of radioactive waste by deep-well injection of liquids | As above | AG 1981/17 | 1982 | C.2.2/7 |
| 38 | Technical Report on site investigation for disposal of radioactive waste by hydraulic fracturing | As above | AG 1981/17 | 1982 | C.2.2/7 |
| 39 | Safety Series Recommendations on design and construction of waste repositories in shallow ground | As above | TC 1982/16 | 1983 | C.2.2/9 |
| 40 | Safety Series Recommendations on design and construction of waste repositories in rock caverns | As above | TC 1982/17 | 1984 | C.2.2/9 |
| 41 | Safety Series Recommendations on the operation, shut-down and surveillance of shallow ground waste repositories | As above | AG 1982/18 | 1983 | C.2.2/10 |
| 42 | Safety Series Recommendations on the operation, shut-down and surveillance of waste repositories in rock caverns | As above | AG 1982/19 | 1984 | C.2.2/10 |
| 43 | IAEA-TECDOC on effects of heat and radiation from radioactive waste on underground disposal | As above | TC 1982/20 | 1982 | C.2.2/11 |
| 44 | IAEA-TECDOC on pathways for radionuclide releases of regional and global concern | Agency Secretariat | AG 1981/18 | 1981 | C.2.3/10 |
| 45 | IAEA-TECDOC on models and radiological basis for Safety Series recommendations on radionuclide releases of regional and global concern | Agency Secretariat, national regulatory bodies, technical and administrative personnel responsible for national waste management programmes and international bodies concerned with this subject | AG 1982/21 | 1983 Safety Series document in 1984 | C.2.3/10 |
| 46 | Technical Report on atmospheric dispersion models | As above | TC 1982/22 | 1983 | C.2.3/10 |
| 47 | IAEA-TECDOC on definition of de minimis quantities for release of solid waste to the terrestrial environment | As above | AG 1981/19 | 1982 | C.2.3/13 |
| 48 | IAEA-TECDOC on an oceanographic model for the Agency's Definition for the London Dumping Convention | Agency Secretariat, IMCO | AG 1981/20 | 1982 | C.2.3/15 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 49 | IAEA-TECDOC on radiological basis for the Agency's Definition for the London Dumping Convention | As above | AG 1982/23 | 1983 | C.2.3/15 |
| 50 | Technical Report on de minimis quantities exempted from permits for dumping at sea | National regulatory bodies, technical and administrative personnel responsible for national waste management programmes and international bodies concerned with this subject | AG 1981/21 | 1982 | C.2.3/16 |
| 51 | IAEA-TECDOC on environmental assessment of sea dumping activities | As above | AG 1982/24 | 1982 | C.2.3/16 |
| 52 | IAEA-TECDOC on methodology for assessment of sea dumping versus underground disposal | As above | AG 1982/25 | 1982 | C.2.3/16 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | NEA/IAEA Steering Group on uranium resources | C.1.1/8 |
| 2. | Technical Committee on uranium geology and mining in Africa | C.1.1/9 |
| 3. | Technical Committee on fuel performance and technology (IWG) | C.1.2/8 |
| 4. | Specialists' meeting on high burn-up in power water reactor fuels (IWG) | C.1.2/9 |
| 5. | Specialists' meeting on post-irradiation examination of power reactor fuel assemblies (IWG) | C.1.2/10 |
| 6. | Specialists' meeting on improved fuel technology | C.1.2/14 |
| 7. | Technical Committee on treatment of low and intermediate level liquid waste | C.2.1/9 |
| 8. | Technical Committee on interim storage, handling and transportation of low-intermediate level waste prior to and after conditioning | C.2.1/10 |
| 9. | Technical Committee on interim storage of and techniques for handling conditioned high-level waste | C.2.1/10 |
| 10. | Technical Committee on testing and in-plant monitoring of off-gas cleaning systems at nuclear facilities | C.2.1/11 |
| 11. | Technical Review Committee on underground disposal of radioactive waste | C.2.2/5 |
| 12. | Advisory Group on basic criteria for underground disposal | C.2.2/6 |
| 13. | Advisory Group on safety analysis of radioactive waste repositories in shallow ground and rock caverns | C.2.2/6 |
| 14. | Advisory Group on guidelines for disposal of solid radioactive waste in rock caverns | C.2.2/6 |
| 15. | Advisory Group on application of radiological safety standards to underground disposal | C.2.2/6 |
| 16. | Advisory Group on site selection and site investigation for radioactive waste repositories in rock caverns, including abandoned mines | C.2.2/7 |

| 1981 | | Paragraph |
|---|---|---|
| 17. | Advisory Group on site selection and site investigation for fluid waste disposal in deep geological formations | C.2.2/7 |
| 18. | Advisory Group on pathways for radionuclide releases of regional and world-wide interest | C.2.3/10 |
| 19. | Advisory Group on definition of de minimis quantities for release into the terrestial environment | C.2.3/13 |
| 20. | Advisory Group on revision of oceanographic basis for IAEA recommendations under London Dumping Convention | C.2.3/15 |
| 21. | Advisory Group on de minimis quantities for London Dumping Convention | C.2.3/16 |

| 1982 | | |
|---|---|---|
| 1. | NEA/IAEA Steering Group on uranium resources | C.1.1/8 |
| 2. | Technical Committee on uranium ore dressing and refining | C.1.1/15 |
| 3. | Specialists' meeting on fuel element reliability and safety aspects of fuel element behaviour (IWG) | C.1.2/11 |
| 4. | Specialists' meeting on improving water reactor fuel utilization (IWG) | C.1.2/11 |
| 5. | Advisory Group on methods for treatment of low-intermediate level liquid waste | C.2.1/9 |
| 6. | Technical Committee on management of control rods and other intermediate level waste components from nuclear facilities | C.2.1/9 |
| 7. | Advisory Group on Code of Practice on Management of Radioactive Waste from Nuclear Power Plants | C.2.1/9 |
| 8. | Advisory Group on conditioning requirements for storage and disposal of radioactive waste | C.2.1/10 |
| 9. | Advisory Group on testing of particulate filters | C.2.1/11 |
| 10. | Advisory Group on operation of off-gas cleaning systems at nuclear facilities | C.2.1/11 |
| 11. | Advisory Group to review Code of Practice on the Management of Wastes from the Mining and Milling of Uranium and Thorium Ores | C.2.1/12 |
| 12. | Technical Committee on nuclear facility decontamination techniques and the management of waste from decontamination and decommissioning activities | C.2.1/13 |
| 13. | Technical Review Committee on the underground disposal of radioactive wastes | C.2.2/5 |
| 14. | Advisory Group on basic criteria for underground disposal of radioactive wastes | C.2.2/6 |
| 15. | Advisory Group on regulation of underground disposal | C.2.2/6 |
| 16. | Technical Committee on design and construction of solid waste repositories in shallow ground | C.2.2/9 |
| 17. | Technical Committee on design and construction of solid-waste repositories in rock caverns | C.2.2/9 |
| 18. | Advisory Group on the operation, shut-down and surveillance of shallow-ground waste repositories | C.2.2/10 |
| 19. | Advisory Group on the operation, shut-down and surveillance of rock-cavern waste repositories | C.2.2/10 |
| 20. | Technical Committee on the effects of heat and radiation from radioactive waste in underground disposal | C.2.2/11 |
| 21. | Advisory Group on models and radiological basis for recommendations on radionuclides releases of regional and world-wide interest | C.2.3/10 |
| 22. | Technical Committee on atmospheric dispersion models | C.2.3/10 |
| 23. | Advisory Group on radiological basis for IAEA recommendations under London Dumping Convention | C.2.3/15 |
| 24. | Advisory Group on environmental assessment of sea dumping activities | C.2.3/16 |
| 25 | Advisory Group on methodology for sea-dumping versus underground disposal of radioactive waste | C.2.3/16 |

# D. NUCLEAR SAFETY

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table D.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 815 525 | 1 603 000 | 97 000 | 48 000 | 145 000 | 1 748 000 | 1 897 000 | 2 037 000 |
| Consultants | 124 229 | 139 200 | 17 800 | 4 700 | 22 500 | 161 700 | 203 000 | 227 000 |
| Overtime | 9 420 | 13 800 | 700 | (1 900) | (1 200) | 12 600 | 15 600 | 17 300 |
| Temporary assistance | 7 395 | 3 700 | 200 | (300) | (100) | 3 600 | 4 600 | 5 000 |
| Sub-total | 1 956 569 | 1 759 700 | 115 700 | 50 500 | 166 200 | 1 925 900 | 2 120 200 | 2 286 300 |
| Common staff costs | 553 647 | 464 500 | 54 100 | 15 000 | 69 100 | 533 600 | 588 000 | 631 000 |
| Travel | 62 861 | 82 900 | 12 000 | 26 000 | 38 000 | 120 900 | 143 200 | 152 200 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 103 437 | 30 000 | 6 000 | 63 000 | 69 000 | 99 000 | 69 000 | 70 000 |
| Technical committees, advisory groups | 506 577 | 571 000 | 85 000 | 16 000 | 101 000 | 672 000 | 611 000 | 631 000 |
| Representation and hospitality | 15 081 | 10 100 | 300 | 200 | 500 | 10 600 | 13 800 | 15 500 |
| Scientific and technical contracts | 279 612 | 173 000 | 13 000 | (16 000) | (3 000) | 170 000 | 170 000 | 170 000 |
| Scientific supplies and equipment | 25 457 | 49 500 | 5 000 | 21 500 | 26 500 | 76 000 | 57 000 | 59 000 |
| Common services, supplies and equipment | 3 363 | 11 300 | 700 | 4 000 | 4 700 | 16 000 | 8 800 | 10 000 |
| Transfers of costs: | | | | | | | | |
| Linguistic services | 532 792 | 409 000 | 23 000 | 30 000 | 53 000 | 462 000 | 474 000 | 501 000 |
| Printing and publishing services | 782 481 | 555 000 | 69 000 | 3 000 | 72 000 | 627 000 | 640 000 | 653 000 |
| Data processing services | 2 224 | 15 000 | (500) | 7 500 | 7 000 | 22 000 | 31 000 | 37 000 |
| To other: PNE | (38 000) | (48 000) | (4 000) | 19 000 | 15 000 | (33 000) | (35 000) | (37 000) |
| Conference services | – | 64 000 | 5 000 | 26 000 | 31 000 | 95 000 | 78 000 | 77 000 |
| TOTAL | 4 786 101 | 4 147 000 | 384 300 | 265 700 | 650 000 | 4 797 000 | 4 969 000 | 5 256 000 |

## SUMMARY OF MANPOWER

Table D.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 16 | 16 | 10 | 2 | 12 | 13 | 13 |
| P-4 | 16 | 16 | 11 | (1) | 10 | 10 | 10 |
| P-3 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| P-2 | – | – | 1 | (1) | – | – | – |
| Sub-total | 36 | 36 | 26 | – | 26 | 27 | 27 |
| GS | 25 | 26 | 20 | – | 20 | 20 | 20 |
| TOTAL | 61 | 62 | 46 | – | 46 | 47 | 47 |

## CHANGES IN COSTS AND MANPOWER

### Costs

D/1. As will be seen from Table D.1 above, the cost of this programme is expected to increase by $650 000, of which $384 300 will be required to cover salary and other price increases and $265 700 will be a programme increase.

D/2. A programme increase of $63 000 in respect of salaries and common staff costs is attributable primarily to the proposed creation of an additional P-5 post for the "Safety of nuclear installations" sub-programme, through the transfer of a P-2 post from another programme in the adjusted manning table for 1980 and its up-grading to the P-5 level in 1981.

D/3. Programme increases are also foreseen in respect of consultants' services ($4700), duty travel ($26 000) and meetings ($79 000). It is planned to hold one symposium and two seminars in 1981, compared with one seminar in the 1980 budget, resulting in a programme increase of $63 000. The programme increase of $16 000 in respect of technical committees and advisory groups is attributable to an increase in the number of meetings planned for 1981 as compared with the budget for 1980.

D/4. The programme decrease of $16 000 in respect of scientific and technical contracts is related mainly to the "Radiological safety" sub-programme. It is offset by a programme increase of $21 500 in respect of scientific supplies and equipment, which is required for the Radiation Protection Service and for the updating of emergency kits used under the "Radiological safety" sub-programme. The programme increase of $4 000 in respect of common services, supplies and equipment is related to the acquisition of training films and to the allocation of the cost of long-distance telephone calls to the programme.

D/5. As regards the allocation of service costs, programme increases are foreseen in respect of linguistic services (30 000), printing and publishing services ($3 000), data processing services ($7 500) and conference services ($26 000). The programme increase in respect of conference services reflects the increase in the number of meetings planned for 1981. There will be a programme decrease of $19 000 in the charges transferred to the "Nuclear Explosions for Peaceful Purposes" programme for services rendered to that programme.

D/6. As can be seen from Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–1981), it is expected that UNEP will support this programme with a contribution of $12 000.

## Summary of manpower and costs by sub-programme

Table D.3

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | Man-years | | Costs | Man-years | | Costs |
| | P | GS | | P | GS | | P | GS | |
| Radiological safety | 11.3 | 9.4 | 2 103 000 | 12.3 | 9.4 | 2 278 000 | 12.3 | 9.4 | 2 371 000 |
| Safety of nuclear installations | 11.6 | 7.4 | 2 396 000 | 11.6 | 7.4 | 2 393 000 | 11.6 | 7.4 | 2 573 000 |
| Radiation protection service | 3.1 | 3.2 | 298 000 | 3.1 | 3.2 | 298 000 | 3.1 | 3.2 | 312 000 |
| TOTAL | 26.0 | 20.0 | 4 797 000 | 27.0 | 20.0 | 4 969 000 | 27.0 | 20.0 | 5 256 000 |

Manpower

D/7. As will be seen from Table D.2 above, one GS post and one P-2 post are being transferred to this programme in the adjusted manning table for 1980. The "1980 Adjusted" column also reflects the reorganization of the Department of Technical Operations, in the course of which 11 Professional posts (6 at the P-5 and 5 at the P-4 level) and seven GS posts are being transferred to the newly established "Nuclear Fuel Cyle" programme.

D/8. For 1982 the need for one additional P-5 post (for work in the field of emergency preparedness) in the "Radiological safety" sub-programme is foreseen. No changes are foreseen for 1983.

## THE PROGRAMME

### OBJECTIVE

D/9. The objective is to ensure the safe utilization of nuclear energy and the protection of man and his environment from the harmful effects of nuclear radiation and radioactive and non-radioactive releases from nuclear facilities.

### STRUCTURE

D/10. This programme consists of three sub-programmes, which are dealt with separately below.

*(see Table D.3)*

## SUB-PROGRAMME D.1

Radiological safety

### OBJECTIVE

D.1/1. The objective is to assist – through the provision of standards, recommendations, guidance and practical assistance – in the further development and harmonization, within Member States, of practices for the protection of workers and the general public against harmful effects of ionizing radiation arising in the peaceful utilization of atomic energy.

### OUTLINE FOR 1981–86

D.1/2. Work will continue on:

(a) The preparation and updating of standards, guides, recommendations and procedures for the radiological protection of workers and the general public;
(b) The dissemination of information on radiation protection methods, procedures and instrumentation;
(c) The provision of assistance to Member States in applying and implementing the Agency's radiological safety standards and recommendations and in training their specialists, particularly in emergency preparedness;
(d) The assessment of societal and environmental risks and their relationship to decision-making; and
(e) The promotion and co-ordination of research related to radiological protection.

### STRUCTURE

D.1/3. The sub-programme consists of five components, which are described in the following paragraphs.

## Radiological safety

### Summary by programme components

Table D.4

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Radiological protection of workers | 2.5 | 1.7 | 266 500 | 88 000 | 60 000 | 12 500 | 427 000 |
| Radiological protection of the general public | 2.3 | 1.6 | 220 300 | 59 000 | 60 000 | 16 700 | 356 000 |
| Safe transport of radioactive materials | 2.4 | 1.5 | 232 200 | 58 000 | 22 000 | 10 800 | 323 000 |
| Risk assessment research; joint IAEA/IIASA project | 3.1 | 3.7 | 338 900 | – | 22 000 | 5 100 | 366 000 |
| Emergency assistance with regard to nuclear accidents | 1.0 | 0.9 | 77 500 | 63 000 | 6 000 | 26 500 | 173 000 |
| Linguistic services | – | – | – | – | – | 178 000 | 178 000 |
| Printing and publishing services | – | – | – | – | – | 252 000 | 252 000 |
| Data processing services | – | – | – | – | – | 22 000 | 22 000 |
| Conference services | – | – | – | – | – | 39 000 | 39 000 |
| Transfers to other programmes for direct support | – | – | – | – | – | (33 000) | (33 000) |
| TOTAL | 11.3 | 9.4 | 1 135 400 | 268 000 | 170 000 | 529 600 | 2 103 000 |

## Radiological protection of workers (component D.1.1)

### Objective

D.1.1/1. The objective is to provide standards, guides and recommendations related to design criteria, working environment monitoring, optimization of the protection of workers, and assessment of individual and collective doses.

### Results to date

D.1.1/2. This component was initiated in 1958. Standards, guides and recommendations have been published on: the radiological safety aspects of protecting workers in uranium mining and milling, nuclear fuel fabrication plants, power reactors, hot laboratories, and electron and neutron generator facilities; on the physical and medical surveillance of workers; and on emergency plans and procedures.

D.1.1/3. During the period 1975–80, the proceedings of three symposia and one seminar were published and eight volumes were issued in the Agency's Safety Series (Radiological Safety Aspects of the Operation of Neutron Generators – No. 42; Manual on Early Medical Treatment of Possible Radiation Injury – No. 47; Manual on Decontamination of Surfaces – No. 48; Radiological Surveillance of Airborne Contamination in the Working Environment – No. 49; Code of Practice on the Basic Requirements for Personnel Monitoring – Revision of No. 14; Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores – Revision of No. 26; Safety Aspects of the Design and Equipment of Hot Laboratories – Revision of No. 30; Manual on Neutron Monitoring). In addition, five reports were issued in the Technical Reports Series. Three training courses and four regional seminars included the radiological protection of workers as substantial parts of their programmes. Lectures were given at training

courses arranged under other Agency programmes. In conjunction with the Waste Management Section, a study tour concerned with radiation protection and waste management was organized for 21 scientists and engineers from developing countries. A co-ordinated research and intercomparison programme on nuclear accident dosimetry systems was completed in 1977; another programme on the use of cell membrane probes as biological indicators in cases of accidental exposure to radiation is finishing in 1980 (Table D.7, No.1).

D.1.1/4. In 1976, a study was initiated, in co-operation with NEA and UNSCEAR, on the assessment of individual and collective occupational exposure in nuclear programmes throughout the world. In 1978, a questionnaire was sent to all Member States operating nuclear power plants to collect occupational exposure data. Results appear in the proceedings of a joint IAEA/NEA symposium held in 1979.

D.1.1/5. Since 1976, the major emphasis has been on the revision of the 1967 edition of the Agency's Basic Safety Standards for Radiation Protection (Safety Series No. 9) to take account of the recommendations in ICRP publication No. 26 (1977). Advisory Group meetings were held in 1977 and 1978, and a final meeting is to be held in 1980 to accomplish this complex task, which is essential for the updating of other documents in the Safety Series.

Plans for 1981–82

D.1.1/6. Work will include the development or updating of the following safety standards, guides, recommendations and procedures in the light of the new ICRP dose limitation system published in 1977 and subsequently modified and expanded:

(a) The major task, the revision of the Agency's Basic Safety Standards for Radiation Protection (No.9) is expected to be completed in 1981 (Table D.8, No.1);
(b) A publication on the Safe Use of Radioactive Sources and Tracers in Agriculture, Food and Fisheries will be prepared in 1981 and will include guidance on the protection of the public in the use of radioactive tracers and during irradiation experiments (Table D.8, No.2);
(c) The Code of Practice on the Provision of Radiological Protection Services (No.13) will be revised in 1982 (Table D.8, No.3);
(d) The Recommendations on Radiation Protection Procedures (No.38) will be revised;
(e) With the help of consultants and an Advisory Group, the Manual on Safety Aspects of the Design and Equipment of Hot Laboratories (No.30) will be revised in 1981 (Table D.8, No.4);
(f) Work will be completed in 1981 on the revision of the Code of Practice on the Safe Handling of Plutonium.

D.1.1/7. Work will begin on the revision of Safety Series No.25, Medical Supervision of Radiation Workers (1968), which will be applicable to health evaluation under normal working conditions (Table D.8, No.5). This will be done in collaboration with WHO and ILO. Similarly, work will start with a consultant group on the revision of the Procedures and Data on Respirators and Protective Clothing to update Safety Series No.22. Continued co-operative evaluation with NEA of occupational exposures in the nuclear fuel cycle will suggest specific measures and techniques for reducing the doses received. Also in 1981, a symposium will focus on the application of the dose limitation system to the fuel cycle (Annex I (4)).

D.1.1/8. Co-ordinated research programmes on the refinement of lung-counting techniques for the measurement of incorporated plutonium and on the application of chromosome analysis to radiation protection monitoring will be initiated. It is planned to start a further programme in 1981 on the track etch technique as a practical personal monitor for radon and its daughter products.

D.1.1/9. A document dealing with the radiological safety aspects of accelerator operations will be prepared (Table D.8, No.6). In 1981, with the help of consultants, the current needs and problem areas in applied radiation protection will be identified to guide future programmes.

Related activities

D.1.1/10. Health and safety inspection missions in conjunction with the Nuclear Safety Section will continue to advise on the adequacy of radiological safety of workers in Agency-sponsored research reactor projects. Agency staff will attend selected meetings of other international organizations to ensure harmonization of programmes involving the radiation protection of workers. Advisory services will continue to be provided to Member States and to international organizations.

Outline of changes during 1983–86

D.1.1/11. Attention will be given to the radiological safety aspects of decommissioning and the storage of irradiated fuel.

Co-operation with other organizations

D.1.1/12. Co-operation will be maintained with ICRP, UNSCEAR, WHO, ILO, NEA, CMEA, ISO and ECE.

Radiological protection of the general public (component D.1.2)

Objective

D.1.2/1. The objective is to provide standards, guides and recommendations on effluent monitoring, environmental pathway monitoring, optimization of protection of the public, and assessment of individual and collective doses.

Results to date

D.1.2/2. This component was initiated in 1958. Standards, guides and recommendations have been published on the radiological safety aspects of protecting members of the public, through effluent and environmental monitoring programmes and by the management of accidents which might involve exposure of the public to radiation.

D.1.2/3. During the period 1975–80, the proceedings of two symposia were published and three volumes were issued in the Agency's Safety Series (Objectives and Design of Environmental Monitoring Programmes for Radioactive Contaminants – No. 41; Manual on Radiological Safety in Uranium and Thorium Mines and Mills – No. 43; Principles for Establishing Limits for the Release of Radioactive Materials into the Environment – No. 45). Three training courses and four regional seminars included the radiological protection of the general public as substantial parts of their programmes. Lectures were given at training courses arranged under other Agency programmes. Co-ordinated research programmes on environmental monitoring for radiation protection purposes in collaboration with institutes in South East Asia and Latin America were completed in 1979. A programme of co-operation in radiological safety matters between countries in the Danube catchment area is continuing, along with a co-ordinated research programme on the radioecology of the Danube (Table D.7, No.2). A similar programme of co-operation between countries bordering on the Baltic Sea was initiated in 1979. A preliminary Advisory Group meeting on the application of cost-benefit analysis to radiation protection was held in 1979.

Plans for 1981–82

D.1.2/4. Work will include development or updating of the following safety standards, guides and procedures in the light of the new ICRP dose limitation system published in 1977 and subsequently modified and expanded:

(a) Further guidance will be provided on procedures for establishing limits for the release of radioactive material into the environment. A Safety Series document will be completed in 1981 (Table D.8, No.7);
(b) With the help of consultants, a publication will be provided on the Radiological Safety Aspects of Fire Fighting in Nuclear Facilities. This programme is oriented towards the protection of fire fighters;
(c) At the request of the Agency's International Fusion Research Council, consultants will prepare a draft report on the radiological safety aspects and environmental impact of fusion power.

D.1.2/5. The existing co-ordinated research programme between countries in the Danube catchment area on questions of environmental contamination and radioecology will be completed (Table D.7, No.2). It is planned to start this year a co-ordinated research programme to study current levels of radioactive materials in the Baltic Sea through intercomparison of sampling and analytical techniques (Table D.8, No.8). The possibility of similar co-operative programmes in other regional areas of environmental concern, such as international rivers or seas, will be explored.

D.1.2/6. In addition, a document on the application of cost-benefit analysis to radiation protection as recommended in the ICRP's dose limitation system (1977) will be produced. An additional Advisory Group meeting in this fast developing area will be held in 1981 to complete this Safety Series document (Table D.8, No.9).

D.1.2/7. With the aid of consultants, work will start in 1982 on the revision of Safety Series No.21, "Risk Evaluation for Protection of the Public in Radiation Accidents".

D.1.2/8. In co-ordination with the Waste Management Section, work will continue on the co-ordinated research programme on the release of carbon-14 from nuclear facilities into the environment (Table C.6, No.11).

Related activities

D.1.2/9. Health and safety inspection missions made in conjunction with the Nuclear Safety Section will continue to advise on the adequacy of environmental safety in Agency-sponsored research reactor projects.

D.1.2/10. Agency staff will attend selected meetings of other international organizations to ensure harmonization of programmes involving the radiation protection of the general public. Advisory services will continue to be provided at the request of Member States and international organizations.

Outline of changes during 1983–86

D.1.2/11. Attention will be given to the environmental safety aspects of the storage and disposal of radioactive waste and to risk assessment for atmospheric releases. As the number of developing countries entering the nuclear power field increases, additional emphasis will be placed on safety missions sent to Member States upon request to ensure that adequate radiological and environmental safety measures are being implemented.

Co-operation with other organizations

D.1.2/12. Co-operation will be maintained with ICRP, UNSCEAR, UNEP, WHO, FAO, NEA, CMEA and ECE.

## Safe transport of radioactive materials (component D.1.3)

Objective

D.1.3/1. The objective is to provide standards and recommendations which can be used in formulating international and national regulations for the safe transport of radioactive materials, to advise and assist Member States and international organizations in connection with the effective application of such regulations, and to further public acceptance of the adequacy of the standards.

Results to date

D.1.3/2. The programme on safe transport began in 1958 and was initially concerned with establishing and updating a comprehensive set of regulations and encouraging their adoption by international organizations and individual Member States. The latest "Regulations for the Safe Transport of Radioactive Materials", 1973 Revised Edition, as amended – Safety Series No. 6, was published in 1979. The programme was expanded in 1978, primarily to aid Member States and international organizations in the effective application of the regulations.

D.1.3/3. Advisory material on the application of the regulations (Safety Series No. 37) was revised in 1978 and is to be published as the 1980 Edition. A programme was outlined in 1979 for preparing material explaining the reasons behind various provisions in the regulations and indicating the level of safety which has been achieved. The purpose was to help allay public concern about transport. An Advisory Group convened in 1979 set out the principles underlying the transport regulations as a basis for a comprehensive review and for the preparation of explanatory material. In 1979, Member States and international organizations were invited to submit topics for study and specific proposals for changes in the regulations. In 1980, the Standing Advisory Group on the Safe Transport of Radioactive Materials (SAGSTRAM) held its second meeting and formulated proposals for a comprehensive review of the regulations by an Advisory Group later in the year.

D.1.3/4. Development of a simple system model for assessing the risk from transportation was initiated in 1979, based on methodology made available by a number of Member States. A programme was started in 1979 for co-ordinating research pertaining to packaging and transport, and Member States were encouraged to collect and submit data on types and numbers of shipments and the frequency and consequences of transport accidents (Table D.7, No.3). In addition, information on valid package design approval certificates was collected to enable a quick response to be made to enquiries on specific packages.

Plans for 1981–82

D.1.3/5. A review will be made of performance tests for transport packages and the necessary amendments to the regulations will be prepared (Table D.8, No.10).

D.1.3/6. Safety Standards for the Safe Transport of Radioactive Materials will be reviewed and revised on the basis of advice from the appropriate committees and of comments from Member States (Table D.8, No.11).

D.1.3/7. With the help of consultants, the Advisory Material for the Application of the IAEA Transport Regulations (Safety Series No. 37) will be revised (Table D.8, No. 12). The co-ordinated research programme on safe transport will be continued (Table D.7, No.3). With the help of consultants, a Safety Guide for evaluating compliance with the regulations and standardizing compliance assurance procedures in their application will be prepared (Table D.8, No.13).

Related activities

D.1.3/8. Agency staff will attend selected meetings of other international organizations with transport regulation functions to ensure harmonization and uniformity in the provisions for the consignment of radioactive materials by all modes of transport. Advisory services will continue to be provided, on request, in matters related to the safe transport of radioactive materials.

Outline of changes during 1983–86

D.1.3/9. Emphasis will be placed on assisting Member States to formulate and implement adequate compliance programmes. Efforts will be made to complete an evaluation of the risk from transport world-wide and to provide information to allay public concern.

Co-operation with other organizations

D.1.3/10. Co-operation will be maintained with ICRP, WHO, ISO, NEA, CMEA, ECE, IATA and the Central Office for International Railway Traffic.

## Risk assessment research; joint IAEA/IIASA project (component D.1.4)

Objective

D.1.4/1. The objectives of this project are to assess the social and environmental risks of energy systems, to refine methods of assessing the beliefs underlying public attitudes towards these systems, to extend the methods to different nations so as to test the universality of these beliefs, and to develop procedures for including technical and social data in the decision-making process.

Results to date

D.1.4/2. This project was started in 1974, Agency staff being augmented by IIASA professional staff and by scientists seconded cost-free to the Agency by interested Member States (nine Member States have participated). Research results are being reported by invitation at scientific conferences and symposia and being published in appropriate professional journals, the IIASA report series and the Agency's Bulletin; so far more than 50 scientific

papers and reports have been published. Studies with sample populations have permitted the development, testing and refinement of survey techniques and the production of a questionnaire over the past three years. This procedure is now being applied in Brazil, Japan, the Federal Republic of Germany and the Philippines, and discussions are being held to extend the programme to several other countries.

D.1.4/3. On the basis of available literature and accident statistics, the risks involved in electricity production by centralized power stations (oil, coal, natural gas, LWR and solar-thermal-electrical conversion) have been compared. Emphasis has been placed on a discussion of the uncertainties in the estimates and on the identification of areas which require further study. The model for $CO_2$ build-up in the atmosphere has been refined and improved, and the risks entailed in building safety systems have been calculated on the basis of data from the Federal Republic of Germany.

Plans for 1981–82

D.1.4/4. It is planned that, after the analysis of the questionnaire completed by university students, the questionnaire itself will be suitably modified for application to members of the general public, to the extent permitted by the secondment of experts from Member States. A meeting of those involved in relevant research programmes will be held in late 1980 or early 1981 to assess interim results, resolve problems in the methodology and assure standardization of the assessment techniques.

D.1.4/5. On the basis of literature survey results and preliminary studies in specific areas, the data on risks involved in energy systems will be updated, other parts of the fuel cycle (e.g. waste disposal) will be included and such features as resource depletion, long-term environmental impacts, land usage, climatic impacts and the supply of energy in forms other than electricity will be considered.

D.1.4/6. The comparison will be extended to include costs and benefits. This also requires development of methodologies which could be used to combine different categories of risk and to compare risks and benefits. These methods will include public perception of low-probability catastrophic events as an integral part of risk assessment studies and techniques for combining physical and socially perceived risks in a form which leads to more accurate decision-making than heretofore. Results will be published in the scientific literature and will be presented at international conferences. A Technical Report summarizing the results is expected to be completed by the end of 1982.

Outline of changes during 1983–86

D.1.4/7. The emphasis will continue to be on cross-cultural studies but will shift more in the direction of practical applications.

## Emergency assistance with regard to nuclear accidents (component D.1.5)

Objective

D.1.5/1. The objective is to help Member States in assessing and improving their emergency preparedness programmes as well as their accident handling capabilities and to enable the Agency to assist in co-ordinating the provision of additional emergency assistance which Member States may require.

Results to date

D.1.5/2. This component was initiated in 1961. Standards, recommendations and guides have been published on off-site emergency response and on the handling of accidents which might involve exposure of the public to radiation. A system has been established for helping Member States to obtain any additional assistance they might require for dealing with the consequences of radiation accidents. A document (Document WP/35), prepared in collaboration with WHO, ILO and FAO and distributed to all Member States, outlines the nature of the emergency assistance which Member States might be willing to make available on request and indicates the preferred channels of communication; this additional document is brought up to date periodically. The most recent revision, No. 4, was published with the

collaboration of UNDRO in mid-1980. The Agency is prepared to act, on request, as an intermediary between Member States to obtain emergency resources such as trained personnel and specialized equipment or the use of specialized facilities and, if necessary, to send staff members to the site of an accident to act as observers.

D.1.5/3. The Nordic Agreement on Emergency Assistance, prepared in co-operation with the Legal Division, was signed by Denmark, Finland, Norway, Sweden and the Agency in 1963; model agreements for the provision of emergency assistance by Member States on a bilateral or multilateral basis have also been prepared.

D.1.5/4. A symposium on the Handling of Radiation Accidents was held in 1977. A document entitled "Planning for Off-Site Response to Radiation Accidents in Nuclear Facilities" was issued in 1979 and "Procedures to be Followed in the Event of Accidents During the Transport of Radioactive Material" was published in 1980. In 1977, the Agency and UNDRO concluded an agreement concerning the co-ordination of emergency assistance and response in the event of radiation accidents.

D.1.5/5. In 1979, Member States were again encouraged by a circular letter to evaluate the spectrum of accidents which could occur at their nuclear facilities and result in over-exposures to radiation or the uncontrolled release of radioactive materials to the environment. The national capabilities for handling these emergencies were evaluated. If special or supplementary emergency resource needs were identified, Member States were encouraged to enter into bilateral or multilateral agreements for the provision of emergency assistance with neighbouring Member States and with the Agency.

D.1.5/6. In 1979, as part of the Supplementary Nuclear Power Safety Programme, a working paper was developed with the help of consultants to expand the Agency's Radiation Emergency Assistance Plan to include a broader range of nuclear accidents. Also drafted were lists of the types of specialists, both individuals and teams, from design and construction organizations, electric utilities, regulatory organizations, medical facilities and other groups, who might be needed to assist Member States in the management of a major nuclear accident. A Technical Committee in 1980 is to finalize the expansion of the Agency's Emergency Assistance Programme and further develop the resources in terms of people, equipment and services needed in the management of a nuclear accident.

D.1.5/7. During the period 1975–80, drills were carried out from time to time to test the smooth working of the system for alerting Agency staff and the procedures for handling radiation injury requests, obtaining specialized emergency resources or sending observers to the site of an accident in response to a request received at any time. A consultant reviewed the system and drew up recommendations for its improvement. Items were added, as necessary, to the instruments and protective equipment held in readiness for use by designated staff members in an emergency. New staff members were given instructions concerning their possible role in co-ordinating emergency assistance.

Plans for 1981–82

D.1.5/8. The Agency's emergency assistance programme will be further developed and extended and in particular the question of preparedness will be reviewed with the assistance of an Advisory Group (Table D.8, No. 14). Additional drills and exercises will be carried out from time to time to test and upgrade the response to simulated requests for assistance. The roster of specialists and the emergency resources will be expanded and kept up to date. Training needs for emergency personnel will be determined and assistance in the development and assessment of emergency plans will be provided.

Related activities

D.1.5/9. Special missions will advise on the adequacy of emergency plans and participate in emergency training exercises. Agency staff will attend selected meetings of other international organizations to harmonize programmes involving emergency planning.

D.1.5/10. A regional seminar will be held in South East Asia in 1981 on radiation emergency preparedness (Annex I (5)). This will include the medical management of radiation injuries. In 1982, a seminar will be held in South America (Annex II (6)).

D.1.5/11. Advisory services will be provided at the request of Member States and international organizations on emergency planning and preparedness. Subject to the availability of funds, consultant lectures, special missions,

regional training courses and study tours on emergency plans will be organized for regulatory, utility and other appropriate personnel, especially those from countries in the early stages of nuclear programmes.

Co-operation with other organizations

D.1.5/12. Co-operation will be maintained with UNDRO, IIASA, WHO, FAO, NEA, CMEA and ECE.

## SUB-PROGRAMME D.2

### Safety of nuclear installations

OBJECTIVE

D.2/1. The objective is to give Member States up-to-date advice and assistance (through safety advisory missions, the establishment of a coherent and comprehensive set of internationally acceptable safety codes and guides, the exchange of information and training relating to specific nuclear safety and regulatory topics) in connection with the regulation, siting, design, construction and operation of research reactors, nuclear power plants and other nuclear facilities.

OUTLINE FOR 1981–86

D.2/2. The Agency will, through its safety standards programme, publish a number of safety guides to complement the codes of practice already issued. In addition, earlier safety guides will be revised or supplemented and – where appropriate – their scope will be extended to include advanced nuclear power plants and fuel cycle facilities, the final aim being an internationally agreed set of safety codes and guides, the need for which has become clear as more and more developing countries have purchased nuclear power plants. The use of these codes and guides in establishing national regulations will be promoted.

D.2/3. In the light of over 20 years of experience, it is expected that there will continue to be an increase in the number of requests for advisory services and safety assessments relating to the siting, design, construction and operation of nuclear power plants and research reactors.

D.2/4. The exchange of information through symposia and seminars will continue. Efforts to help Member States embarking on nuclear programmes to cope with reactor safety matters by themselves will be intensified (in particular through the provision of training and of guidance on regulatory activities and other relevant topics).

D.2/5. An exchange of information on the progress in nuclear safety research and development in Member States will be promoted and nuclear safety research and development activities will be co-ordinated with both NEA and CMEA so that the Agency will be better placed to disseminate this information to developing countries.

STRUCTURE

D.2/6. This sub-programme consists of five components, which are described in the following paragraphs.

## Safety of nuclear installations

Summary by programme components

Table D.5

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Nuclear safety standards for thermal-neutron nuclear power plants | 5.4 | 5.5 | 597 100 | 414 000 | – | 9 900 | 1 021 000 |
| Nuclear safety standards for advanced nuclear power plants and for fuel cycle facilities | 0.9 | 0.4 | 84 800 | – | – | 200 | 85 000 |
| Advisory missions and safety evaluations of nuclear reactors and other nuclear facilities | 4.1 | 1.0 | 320 000 | 19 000 | – | 44 000 | 383 000 |
| Exchange of information and training | 1.3 | 0.5 | 98 500 | 51 000 | – | 25 500 | 175 000 |
| Nuclear reactor safety research and development | 0.2 | 0.2 | 24 400 | 19 000 | – | 1 600 | 45 000 |
| Linguistic services | – | – | – | – | – | 284 000 | 284 000 |
| Printing and publishing services | – | – | – | – | – | 375 000 | 375 000 |
| Conference services | – | – | – | – | – | 56 000 | 56 000 |
| TOTAL | 11.9 | 7.6 | 1 124 800 | 503 000 | – | 796 200 | 2 424 000 |

### Nuclear safety standards for thermal-neutron nuclear power plants (component D.2.1)

#### Objective

D.2.1/1. The objective is:

(a) to prepare an internationally agreed set of recommendations (in the form of codes, guides and manuals) on the safety of thermal-neutron nuclear power plants (1982–84);
(b) to review such codes and manuals so as to take into account the advance of the technology and the experience gained in using them; and
(c) to promote the use in national regulations and international standards of the Agency's safety codes and guides.

#### Results to date

D.2.1/2. Since the NUSS programme was initiated in September 1974, five codes of practice relating to thermal-neutron nuclear power plants (on governmental organization, siting, design, operation and quality assurance) have been published. Eleven safety guides have been published and 36 are in various stages of preparation or review.

D.2.1/3. The Senior Advisory Group (SAG) was asked in June 1979 to make recommendations on future NUSS programme activities (in particular the development of new and revised documents), taking into account the Three Mile Island accident. This is currently being done. Although no major shifts in the programme are likely to be required, certain safety-related topics and procedures will be given extra emphasis. The SAG has recommended that:
(1) Greater recognition should be given to NUSS documents in Agency training courses;
(2) Regional and topical seminars should be organized to assist in the application and interpretation of NUSS documents;
(3) There should be an expansion of the Agency's capability to provide, on request by Member States, safety missions to help in the local application of the NUSS documents; and
(4) A service to provide case-interpretations of the intent of the NUSS documents should be organized.

Plans for 1981–82

D.2.1/4. For each of the five codes of practice produced, some four to five safety guides will be completed and preparation of the additional guides will be continued (Table D.8, Nos. 15–50). Work will start on manuals for the application of the codes and guides. In addition, a start will be made with the implementation of a procedure for reviewing the codes, guides and manuals after they have been published.

Outline of changes during 1983–86

D.2.1/5. It is expected that with the publication of some ten safety guides in each of the years 1981 and 1982, the set of five codes and forty-seven guides envisaged at the start of the NUSS programme will be complete by the end of the latter year. Some ten additional safety guides (on the siting, design and operation of nuclear power plants) as approved by SAG will be completed by 1984. Some of the codes and guides already issued will be revised or supplemented as appropriate in the light of experience gained with them in practice and of further experience in operating the present generation of nuclear power plants. The use of the codes and guides in establishing national regulations and international standards will be promoted through the preparation of manuals for their application, through Agency participation in national and international meetings and through the preparation of checklists – based on the codes and guides – designed for use during Agency safety missions and covering all points which experts should take into account if they are to make objective judgements.

Co-operation with other organizations

D.2.1/6. This component involves co-operation with NEA, CMEA, ISO, CEC, WMO, WHO and the International Electrotechnical Commission (IEC).

## Nuclear safety standards for advanced nuclear power plants and for fuel cycle facilities (component D.2.2)

Objective

D.2.2/1. The objective is to prepare safety codes and guides for advanced reactor types and for nuclear fuel cycle facilities.

Plans for 1981–86

D.2.2/2. Steps will be taken to extend the safety standards programme to the preparation of codes and guides for nuclear fuel cycle facilities. As it is expected that national safety standards for advanced nuclear power plants will have been issued by 1981/82, work will start on Agency safety standards for such plants. This activity will grow as staff working on the NUSS programme become available, reaching full scale after 1982.

Co-operation with other organizations

D.2.2/3. This component will involve co-operation with NEA, CMEA, ISO, CEC, WMO, WHO and the International Electrotechnical Commission (IEC).

## Advisory missions and safety evaluations of nuclear reactors and other nuclear facilities (component D.2.3)

Objective

D.2.3/1 The objective is to advise and assist Member States in connection with the safety aspects of nuclear power plants, research reactors and other nuclear facilities by organizing and co-ordinating the safety missions of Agency staff members and external experts after the study of safety-related reports.

Results to date

D.2.3/2. Safety assessments of research reactor sites have been made since 1960 and advice has been provided on safety levels at nuclear research centres. Advice has been given on the siting of nuclear power plants and safety assessments have been made for such plants at the pre-construction, construction and operating phases. All Agency reactor projects have been evaluated from the nuclear safety point of view before being submitted to the Board of Governors for approval in accordance with statutory requirements; most of the reactors in question have been examined at a later stage and advice on maintaining high safety standards has been given to the responsible national authorities. On average, twelve advisory missions a year have taken place since 1973.

D.2.3/3. Safety information missions are being organized, as requested by SAG, to promote greater recognition of the NUSS documents through explanation and assistance in the application of these documents by the appropriate authorities in Member States.

D.2.3/4. Advice has been given on the safety aspects of the entry into ports of a nuclear merchant ship.

Plans for 1981–82

D.2.3/5. It is expected that the number of requests from Member States for advice on the licensing of nuclear power plants, on the safety aspects of site selection, on the safety assessment of plants and on the safety aspects of the technical specifications set forth in bids will continue to increase (to ten or more a year). The number of safety assessments required under Agency reactor project agreements is also expected to increase. Periodic safety missions (every 2–3 years) will continue to be arranged in connection with research reactors covered by project agreements and an offer will be made to expand the scope of such missions to include nuclear facilities not covered by project agreements and to carry out nuclear safety inspections at nuclear facilities in groups of Member States on a regional basis.

D.2.3/6. A manual will be prepared describing the safety advisory activities and services of the Agency with a view to standardizing such efforts and relating them to the current needs of Member States (Table D.8, No.51).

Outline of changes during 1983–86

D.2.3/7. It is expected that during this period the number of requests for safety advice will increase considerably in respect of all stages of licensing – from siting to operation. It may be necessary to initiate safety assessments of advanced nuclear power plants.

Co-operation with other organizations

D.2.3/8. This component involves co-operation with WMO and WHO.

Exchange of information and training (component D.2.4).

Objective

D.2.4/1. The objective is to assist Member States in the introduction of nuclear power through regional and inter-regional training courses on nuclear facility licensing and regulation and through seminars and symposia relating to the safety of nuclear power plants and to the implementation of the safety codes and guides.

Results to date

D.2.4/2. Staff members have lectured on regulatory activities (including nuclear power plant site and safety evaluations) at the nuclear power training courses at the Kernforschungszentrum Karlsruhe (Federal Republic of Germany), at Argonne National Laboratory (United States), and at the Centre d'Etudes Nucléaires de Saclay (France). Lectures on safety matters have also been given by staff members participating in technical assistance missions to several developing Member States which are considering the introduction of nuclear power or are about to embark on nuclear power projects.

D.2.4/3. A conference is being held in Stockholm in 1980 to clarify nuclear safety issues of importance, with special emphasis on those topics frequently brought up in communications from Member States, such as increased international co-operation in nuclear safety, Agency preparedness and operational safety.

Plans for 1981–82

D.2.4/4. A seminar will be held in 1981 on governmental organization for the regulation of nuclear power plants (Annex I (6)). In the following year a regional seminar will be held on the siting of nuclear power plants in developing countries (Annex II (7)).

D.2.4/5. The roster of safety experts who would be available to work on safety mission assignments will be kept up-to-date. Data on abnormal nuclear plant operating experience will be collected. The more significant safety events will be evaluated and annual meetings organized to review the results with regulatory, utility and supplier staff from Member States (Table D.8, No.52).

Nuclear reactor safety research and development (component D.2.5)

Objective

D.2.5/1. The objective is to keep abreast of the progress in nuclear safety research and development in Member States and to co-ordinate (in co-operation with other international organizations) nuclear safety research and development activities in Member States through liaison with national regulatory bodies in respect of on-going and planned safety research and of safety research facilities.

Results to date

D.2.5/2. Liaison with NEA on topics of common interest in the field of nuclear safety has been maintained through the Committee for Safety of Nuclear Installations. Discussions have been initiated with CMEA on the possibility of the Agency's arranging with them an exchange of information in the field of reactor safety research and development and on co-operation in organizing meetings and preparing a plant reliability data base.

Plans for 1981–82

D.2.5/3. In conjunction with NEA and CMEA, recommendations on how the Agency might expand or continue its activities relating to specialized topics in the field of thermal and fast neutron reactor safety research and development and encourage collaboration among national groups already active in this field will be formulated (Table D.8, No.53).

D.2.5/4. Work will commence on the reviewing and updating of safety documents in the field of research reactors, with particular reference to the safety problems of reactor core conversion (Table D.8, No.54).

Outline of changes during 1983–86

D.2.5/5. Symposia or seminars for disseminating to developing countries the results of reactor safety research and development work will be proposed. As additional safety research facilities become operational and as the results of on-going national safety research programmes emerge, topics for meetings on thermal-neutron and fast reactor safety research will be considered.

## SUB-PROGRAMME D.3

### Radiation protection service

OBJECTIVE

D.3/1. The objective is to provide adequate radiation protection services for the Agency's laboratories and for all persons for whose radiation protection the Agency is responsible and to control the radiological impact of the Agency's

own operations on the general public and the environment. Whenever feasible, other occupational safety aspects will be included in the advisory function of radiation protection services.

Radiation protection service
Summary by programme component

Table D.6

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Radiation protection service | 3.1 | 3.2 | 227 300 | – | – | 70 700 | 298 000 |
| TOTAL | 3.1 | 3.2 | 227 300 | – | – | 70 700 | 298 000 |

## RESULTS TO DATE

D.3/2. Radiation protection services for Agency staff were provided in 1975–79 by the Radiological Safety Section. In late 1979, Radiation Protection Services was established as a separate sub-programme so that the Agency's responsibilities in this area could be more effectively carried out.

D.3/3. Personal monitoring services for external irradiation and bioassay and whole-body monitoring services for internal irradiation have been arranged for staff of the laboratories at Seibersdorf, Monaco and Headquarters, for safeguards inspectors and for other staff. Radiation surveillance has been provided on a continuous basis at Seibersdorf. Advice was given on radiation protection aspects of the design and construction of the Safeguards Analytical Laboratory (SAL) and the new Dosimetry, Medical Applications and Health Physics Laboratories (D&M Annex) at Seibersdorf. Arrangements were made to provide suitable medical care for staff members who might be involved in radiation accidents.

D.3/4. The safety analysis reports for SAL and for the D&M Annex have been reviewed, and assistance and advice have been provided with respect to commissioning.

D.3/5. A small stock of special instruments is maintained in good working order for use in emergency situations and for safety missions.

D.3/6. Training courses have been provided for the Agency's radiation workers and for trainees from Member States participating in courses on the use of isotopes and radiation technique in soil studies.

## PLANS FOR 1981–82

D.3/7. Radiation protection services will continue to be provided for the staff of the laboratories at Seibersdorf, Monaco and Headquarters, for safeguards inspectors and other staff and for technical assistance experts who may be exposed to radiation in the course of their work. Radiation protection training programmes for technical assistance experts and for personnel working at safeguards field offices will be developed.

D.3/8. With the assistance of experts from outside the Agency, rules and procedures will be reviewed periodically and appropriate recommendations will be submitted to the interdepartmental Radiation Protection Committee in order to ensure the incorporation of current principles and technology for the radiation protection of individuals for whose radiation protection the Agency is responsible.

D.3/9. The staff of the various laboratories, safeguards inspectors and (to the extent possible) technical assistance experts will be given training through courses covering specific radiation protection conditions relevant to their duties.

## RELATED ACTIVITIES

D.3/10. The Agency's Laboratory at Seibersdorf will continue to provide bioassay and whole-body monitoring services for occupationally exposed staff and technical services for any environmental monitoring required.

## OUTLINE OF CHANGES DURING 1983–86

D.3/11. Periodic reviews of the Agency's radiation protection rules and procedures will be made to ensure that the documents incorporate current standards, recommendations and technology within the radiation protection field.

D.3/12. Current advances in radiation protection will be incorporated into the Agency's training courses.

Co-ordinated research programmes

Table D.7

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Cell membrane probes as biological indicators in radiation accidents | 4 | 5 | 1977 | 1980 |
| 2. Radiological and environmental protection studies in the Danube river catchment area | 7 | – | 1973 | 1981 |
| 3. Safe transport of radioactive materials | This programme has been approved but no contract has yet been awarded | | | |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table D.8

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | Revision of Safety Series, Basic Safety Standards for Radiation Protection | Health physicists, medical practitioners, administration, public health authorities and legal and regulating bodies | (Advisory Group in Dec. 1980) | 1982 | D.1.1/6 |
| 2 | Safety Series, Recommendations on Safe Use of Radioactive Sources and Tracers in Agriculture, Food and Fisheries | Local authorities and specialists on the large-scale applications of radioisotope techniques in agriculture and the food industry | TC 1981/1 | 1982 | D.1.1/6 |
| 3 | Revision of Safety Series, Code of Practice on the Provision of Radiological Protection Services | Planners and organizers of radiological protection services, and radiation protection personnel | AG 1982/1 Submission to Board in 1983 | 1984 | D.1.1/6 |
| 4 | Revision of Safety Series, Procedures on the Safety Aspects of the Design and Equipment of Radioisotope Laboratories | Planners and designers of radioisotope laboratories and radiation protection personnel | AG 1981/2 | 1983 | D.1.1/6 |
| 5 | Revision of Safety Series, Guide on Medical Supervision of Occupational Workers | Medical and health physics personnel | AG 1982/2 | 1983 | D.1.1/7 |
| 6 | Technical Report on high-energy radiation protection | Accelerator users in industry, applied research and hospitals | AG 1982/3 | 1983 | D.1.1/9 |
| 7 | Safety Series, Procedures for Establishing Limits for the Release of Radioactive Materials into the Environment | Health physicists and public health authorities | AG 1981/3 | 1982 | D.1.2/4 |
| 8 | Technical Report on international studies of the assessment of radioactive materials in the Baltic Sea | Public health and local authorities, radiation protection specialists | TC 1982/4 | 1983 | D.1.2/5 |
| 9 | Safety Series, Recommendations on Application of Cost-Benefit Analysis to Radiation Protection | Health physicists, legal and regulatory bodies | AG 1981/4 | 1982 | D.1.2/6 |
| 10 | Manual on Transport Package Test Standards | Ministries of Transport and Health, international organizations, laboratories and industrial groups working with radioactive materials | TC 1981/5 | 1983 | D.1.3/5 |
| 11 | Revision of Safety Series, Regulations for the Safe Transport of Radioactive Materials | As above | TC 1981/6 and 1981/7 AG 1982/5 | 1983 | D.1.3/6 |
| 12 | Revision of Safety Series, Guide of Advisory Material for the Application of the IAEA Transport Regulations | As above | Consultants' meeting in 1981 | 1983 | D.1.3/7 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 13 | Safety Series, Safety Guide on Assurance of Compliance with the Transport Regulations | As above | Consultants' meeting in 1981 | 1984 | D.1.3/7 |
| 14 | Report on emergency preparedness to handle nuclear accidents | Public health and local authorities, radiation protection specialists, regulatory authorities, Member States and international organizations | AG 1981/8 | 1982 | D.1.5/8 |
| 15 | Safety Guide SG-G9, Establishment of Regulations and Guides by the Regulatory Body and Their Purpose | Regulatory bodies, utilities, designers and constructors of nuclear power plants and the Agency Secretariat | TRC 1981/9<br>SAG 1981/10 | 1982 | D.2.1/4 |
| 16 | Revision of Safety Guide SG-G2, Information to be Submitted in Support of Licensing Applications for Nuclear Power Plants | As above | TRC 1981/11<br>SAG 1982/6 | 1983 | D.2.1/4 |
| 17 | Revision of Safety Guide SG-G1, Qualifications and Training of Staff of the Regulatory Body for Nuclear Power Plants | As above | TRC 1982/7<br>SAG 1982/8 | 1983 | D.2.1/4 |
| 18 | Revision of Safety Guide SG-G3, Conduct of Regulatory Review and Assessment During the Licensing Process for Nuclear Power Plants | As above | TRC 1982/9 | 1983 | D.2.1/4 |
| 19 | Safety Guide SG-S10A, Determination of Design Basis Floods for Nuclear Power Plants on River Sites | As above | SAG 1981/12 | 1982 | D.2.1/4 |
| 20 | Safety Guide SG-S10B, Determination of Design Basis Floods for Nuclear Power Plants on Coastal Sites | As above | TRC 1981/13<br>SAG 1981/10 | 1982 | D.2.1/4 |
| 21 | Safety Guide SG-S11, Evaluation of Extreme Meteorological Events for Nuclear Power Plant Siting | As above | SAG 1981/14 | 1981 | D.2.1/4 |
| 22 | Safety Guide SG-S11B, Design Basis Tropical Cyclones – Wind and Pressure Field | As above | TRC 1981/15<br>SAG 1981/16 | 1982 | D.2.1/4 |
| 23 | Safety Guide SG-S9, Site Survey for Nuclear Power Plants | As above | TRC 1981/17<br>SAG 1981/10 | 1982 | D.2.1/4 |
| 24 | Safety Guide SG-S6, Hydrological Dispersion of Radioactive Material in relation to Nuclear Power Plant Siting | As above | TRC 1981/13 and 1982/10<br>SAG 1982/11 (first draft)<br>TRC 1982/12 | 1983 | D.2.1/4 |
| 25 | Safety Guide SG-S7, Nuclear Power Plant Siting – Hydrogeological Aspects | As above | TRC 1981/15 and 1981/16<br>SAG 1982/13 (first draft)<br>TRC 1982/14<br>SAG 1982/8 | 1983 | D.2.1/4 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 26 | Safety Guide SG-S12, Volcanic Phenomena in Nuclear Power Plant Siting | As above | TRC 1981/18 and 1982/15<br>SAG 1982/8 (first draft)<br>TRC 1982/12 | 1983 | D.2.1/4 |
| 27 | Safety Guide SG-S13, Radiological Protection Aspects relating to Siting | As above | TRC 1981/17 and 1981/18<br>SAG 1982/13 (first draft) | 1982 | D.2.1/4 |
| 28 | Safety Guide SG-D8, Instrumentation and Control of Nuclear Power Plants | As above | TRC 1981/19 and 1981/20<br>SAG 1982/6 (first draft)<br>TRC 1982/16 | 1983 | D.2.1/4 |
| 29 | Safety Guide SG-D7A, Emergency Electrical Power Systems at Nuclear Power Plants | As above | TRC 1981/19<br>SAG 1981/12 | 1982 | D.2.1/4 |
| 30 | Safety Guide SG-D10, Fuel handling and Storage Systems in Nuclear Power Plants | As above | TRC 1981/21 and 1981/22<br>SAG 1982/6 (first draft)<br>TRC 1982/16 | 1983 | D.2.1/4 |
| 31 | Safety Guide SG-D11, General Design Safety Principles | As above | TRC 1981/21 and 1981/22<br>SAG 1982/9 (first draft)<br>TRC 1982/16 | 1983 | D.2.1/4 |
| 32 | Safety Guide SG-D12, Reactor Containment System Design | As above | TRC 1981/20 and 1982/17<br>SAG 1982/11 (first draft) | 1983 | D.2.1/4 |
| 33 | Safety Guide SG-D9, Design Aspects of Radiological Protection for Operational States of Nuclear Power Plants | As above | TRC 1981/24<br>SAG 1982/8 (first draft) | 1983 | D.2.1/4 |
| 34 | Safety Guide SG-D13, Reactor Coolant System | As above | TRC 1982/17 and 1982/19<br>(first draft) | 1984 | D.2.1/4 |
| 35 | Safety Guide SG-D14, Reactor Core Design | As above | TRC 1982/18 and 1982/16<br>(first draft) | 1984 | D.2.1/4 |
| 36 | Safety Guide SG-06, Preparedness of the Operating Organization for Emergencies at Nuclear Power Plants | As above | SAG 1981/14 | 1982 | D.2.1/4 |
| 37 | Safety Guide SG-07, Maintenance of Nuclear Power Plants | As above | SAG 1981/14 | 1982 | D.2.1/4 |
| 38 | Safety Guide SG-08, Surveillance of Items Important to Safety in Nuclear Power Plants | As above | TRC 1981/23<br>SAG 1981/16 | 1982 | D.2.1/4 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 39 | Safety Guide SG-09, Management of Nuclear Power Plants for Safe Operation | As above | TRC 1981/24 and 1982/20<br>SAG 1982/11<br>(first draft) | 1983 | D.2.1/4 |
| 40 | Safety Guide SG-010, Core Management, Fuel Handling and Associated Services | As above | TRC 1981/25 and 1982/21<br>SAG 1982/8<br>(first draft) | 1983 | D.2.1/4 |
| 41 | Safety Guide SG-011, Management of Radioactive Effluents and Wastes from Nuclear Power Plants | As above | TRC 1981/23 and 1981/26<br>(first draft) | 1984 | D.2.1/4 |
| 42 | Revision of Safety Guide SG-01, Staffing of Nuclear Power Plants and Recruitment, Training and Authorization of Operating Personnel | As above | TRC 1982/20 and 1982/22<br>SAG 1982/6 | 1983 | D.2.1/4 |
| 43 | Revision of Safety Guide SG-03, Operational Limits and Conditions for Nuclear Power Plants | As above | TRC 1982/23<br>SAG 1982/8 | 1983 | D.2.1/4 |
| 44 | Safety Guide SG-QA1, Preparation of the Quality Assurance Programme for Nuclear Power Plants | As above | SAG 1981/16<br>(first draft)<br>TRC 1981/27<br>SAG 1982/6 | 1982 | D.2.1/4 |
| 45 | Safety Guide SG-QA7, Quality Assurance Organization for Nuclear Power Plants | As above | TRC 1981/28<br>SAG 1982/13 | 1982 | D.2.1/4 |
| 46 | Safety Guide SG-QA11, Quality Assurance in the Design and Manufacture of Fuel and Fuel Cladding for Nuclear Power Plants | As above | TRC 1981/29<br>SAG 1981/11 | 1982 | D.2.1/4 |
| 47 | Revision of Code-QA, Code of Practice on Quality Assurance for Safety in Nuclear Power Plants | As above | TRC 1982/24<br>SAG 1982/13 | 1983 | D.2.1/4 |
| 48 | Revision of Safety Guide SG-QA2, Quality Assurance Records System for Nuclear Power Plants | As above | TRC 1982/25<br>SAG 1982/11 | 1983 | D.2.1/4 |
| 49 | Revision of Safety Guide SG-QA3, Quality Assurance in the Procurement of Items and Services for Nuclear Power Plants | As above | TRC 1982/25<br>SAG 1982/8 | 1983 | D.2.1/4 |
| 50 | Revision of Safety Guide SG-QA10, Quality Assurance Auditing for Nuclear Power Plants | As above | TRC 1982/26 | 1984 | D.2.1/4 |
| 51 | Document describing assistance available through the IAEA in the area of nuclear power plant safety | As above | TC 1981/30 | 1981 | D.2.3/6 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 52 | Annual report on operating incidents and their safety significance | As above | TRC 1981/31 and 1982/27 | 1982 and 1983 | D.2.4/5 |
| 53 | Report on exchange between Member States of significant reactor safety research results | As above and research workers in nuclear safety | TC 1981/32 and 1982/28 | 1981 and 1982 | D.2.5/3 |
| 54 | Report on review and updating of safety documentation on research reactors | As above | TC 1982/29 | 1982 | D.2.5/4 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Technical Committee on safe use of radioactive sources and tracers in agriculture, food and fisheries | D.1.1/6 |
| 2. | Advisory Group on safety aspects of the design of and equipment for radioisotope laboratories | D.1.1/6 |
| 3. | Advisory Group on procedures for establishing limits for the release of radioactive material into the environment | D.1.2/4 |
| 4. | Advisory Group on the application of cost benefit analysis to radiation protection | D.1.2/6 |
| 5. | Technical Committee on transport package test standards | D.1.3/5 |
| 6. | Standing Advisory Committee on Safe Transport of Radioactive Materials | D.1.3/6 |
| 7. | Technical Committee on nuclear criticality review of packaging and transport | D.1.3/6 |
| 8. | Advisory Group on emergency preparedness to handle nuclear accidents | D.1.5/8 |
| 9–29. | Seventeen Technical Review Committees and four Senior Advisory Groups for NUSS programme | D.2.1/4 |
| 30. | Technical Committee on Agency assistance in area of nuclear power plant safety | D.2.3/6 |
| 31. | Technical Committee on nuclear incidents | D.2.4/5 |
| 32. | Technical Committee on nuclear safety research results | D.2.5/3 |

| 1982 | | |
|---|---|---|
| 1. | Advisory Group on provision of radiological protection services | D.1.1/6 |
| 2. | Advisory Group on medical supervision of occupational workers (normal conditions) | D.1.1/7 |
| 3. | Advisory Group on radiological safety aspects of the operation of accelerators used in industry, hospitals and applied research | D.1.1/9 |
| 4. | Technical Committee on co-operative programme on levels of radioactive materials in the Baltic Sea | D.1.2/5 |
| 5. | Advisory Group on comprehensive review of transport regulations | D.1.3/6 |
| 6–26. | Seventeen Technical Review Committees and four Senior Advisory Groups for NUSS programme | D.2.1/4 |
| 27. | Technical Committee on nuclear incidents | D.2.4/5 |
| 28. | Technical Committee on nuclear safety research results | D.2.5/3 |
| 29. | Technical Committee on review and updating of safety documentation for research reactors | D.2.5/4 |

## E. NUCLEAR EXPLOSIONS FOR PEACEFUL PURPOSES

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table E.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 53 387 | 66 000 | 4 000 | (14 000) | (10 000) | 56 000 | 54 000 | 57 000 |
| Temporary assistance | – | 1 200 | – | (1 200) | (1 200) | – | – | – |
| Sub-total | 53 387 | 67 200 | 4 000 | (15 200) | (11 200) | 56 000 | 54 000 | 57 000 |
| Common staff costs | 16 296 | 19 600 | 2 300 | (4 000) | (1 700) | 17 900 | 17 000 | 18 000 |
| Travel | | 2 200 | – | (2 200) | (2 200) | – | – | – |
| Meetings | | | | | | | | |
| Technical committees, advisory groups | – | – | – | – | – | – | 22 000 | 23 000 |
| Representation and hospitality | – | 800 | – | (800) | (800) | – | 1 000 | 1 000 |
| Common services, supplies and equipment | – | 1 200 | – | (100) | (100) | 1 100 | 1 000 | 1 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 10 224 | 9 000 | 1 000 | (5 000) | (4 000) | 5 000 | 10 000 | 16 000 |
| Printing and publishing services | 353 | 2 000 | 200 | (200) | – | 2 000 | 15 000 | 18 000 |
| Other services | 95 000 | 120 000 | 10 000 | (38 000) | (28 000) | 92 000 | 97 000 | 101 000 |
| Conference services | – | 1 000 | – | (1 000) | (1 000) | – | 2 000 | 2 000 |
| TOTAL | 175 260 | 223 000 | 17 500 | (66 500) | (49 000) | 174 000 | 219 000 | 237 000 |

## SUMMARY OF MANPOWER

Table E.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| P-5 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| Sub-total | 1 | 1 | 1 | – | 1 | 1 | 1 |
| GS | 1 | 1 | – | – | – | – | – |
| TOTAL | 2 | 2 | 1 | – | 1 | 1 | 1 |

## CHANGES IN COSTS AND MANPOWER

### Costs

E/1. As will be seen from Table E.1 above, the cost of this programme is expected to decrease by $49 000 as the net result of salary and other price increases of $17 500 and a programme reduction of $66 500.

E/2. The programme decrease of $18 000 in respect of salaries and common staff costs reflects the fact that in 1981 the post for a secretary will not be required (it is transferred to another programme in the adjusted manning table for 1980). No funds will be required for temporary assistance in 1981, resulting in a programme decrease of $1 200; the same applies to duty travel ($2 200) and hospitality ($800).

E/3. As regards the allocation of service costs, there will be a programme decrease in respect of linguistic services ($5 000), printing and publishing services ($200) and conference services ($1 000). The programme decrease of $38 000 under "Other services" reflects a reduction in the services rendered to this programme by the programmes "Nuclear Power" and "Nuclear Safety".

### Manpower

E/4. Table E.2 reflects the transfer from this programme of one GS post in the adjusted manning table for 1980.

E/5. No further changes are foreseen for 1981, 1982 and 1983.

## THE PROGRAMME

### OBJECTIVE

E/6. The objective is to promote the exchange of information on peaceful uses of nuclear explosions, to develop procedures for their use, to study the economic, legal, health, safety and environmental aspects involved and to respond to requests for PNE-related services.

### RESULTS TO DATE

E/7. The activities constituting this programme were initiated in 1967 as a joint sub-programme within the "Nuclear power and reactors" and "Nuclear safety and environmental protection" programmes. In 1975, the Unit for Peaceful Nuclear Explosions Services was established and the sub-programme was made a separate programme.

E/8. Since 1975, two technical meetings have been held on the phenomenology and practical aspects of PNEs; the status of the technology was reviewed at these meetings, the proceedings of which have been issued in the Agency's Panel Proceedings Series in 1975 and 1978.

E/9. A working group was convened in 1974 to recommend procedures for the Agency to follow in responding to requests for PNE-related services; the procedures relate to the early stages of PNE projects and were followed in the course of a fact-finding mission concerning a potential PNE project in a Member State. The development of procedures to be followed by the Agency in the later stages of PNE projects was initiated in 1977.

E/10. A register for taking note of Member States which wish to be registered as potential suppliers of PNE-related services has been opened.

E/11. A catalogue of possible PNE applications and reports covering economic aspects, health and safety aspects and legal aspects was prepared as an aid to the Ad Hoc Advisory Group on Nuclear Explosions for Peaceful Purposes in the preparation of its comprehensive report, which was completed in 1977.

E/12. A glossary of PNE terms in four languages (English, French, Russian and Spanish) was published at the beginning of 1980. Work on the Agency's bibliography of PNE for the period 1969–1979 has continued.

## PLANS FOR 1981–82

E/13. Activities will depend on the prospects for using PNEs, particularly in developing countries.

E/14. The report prepared by the Ad Hoc Advisory Group on the Peaceful Uses of Nuclear Explosions, which summarizes the status of PNEs and their economic, health and safety and legal aspects, will be the subject of review and updating if justified by the scope of new information available.

E/15. An Advisory Group meeting on health and safety aspects of the use of PNEs is planned for 1982 (Table E.3, No.1).

## OUTLINE OF CHANGES DURING 1983–86

E/16. The Agency's activities in the field of information exchange may continue through further technical committee meetings and smaller meetings of experts on specific topics.

E/17. The reports on the status of PNEs, the PNE bibliography and the PNE glossary will be updated when necessary.

E/18. The Unit for Peaceful Nuclear Explosions Services will continue to be prepared to respond to requests for PNE-related services.

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table E.3

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | IAEA-TECDOC on health and safety aspects of PNEs | All interested Member States | AG 1982/1 | 1983 | E/15. |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1982

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meeting listed below. The reference following the meeting is to the relevant paragraph in the programme.

1. Advisory Group on health and safety aspects of PNEs E/15.

# F. FOOD AND AGRICULTURE

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table F.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 748 265 | 951 000 | 64 000 | – | 64 000 | 1 015 000 | 1 010 000 | 1 069 000 |
| Consultants | 15 583 | 31 000 | 4 000 | 30 000 | 34 000 | 65 000 | 100 000 | 114 000 |
| Overtime | – | 500 | – | – | – | 500 | 500 | 500 |
| Temporary assistance | 4 466 | 2 900 | 200 | (300) | (100) | 2 800 | 4 000 | 4 500 |
| Sub-total | 768 314 | 985 400 | 68 200 | 29 700 | 97 900 | 1 083 300 | 1 114 500 | 1 188 000 |
| Common staff costs | 228 722 | 275 600 | 34 900 | – | 34 900 | 310 500 | 313 500 | 331 000 |
| Travel | 23 196 | 20 200 | 2 800 | – | 2 800 | 23 000 | 57 000 | 61 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 31 121 | 68 000 | 10 000 | 5 000 | 15 000 | 83 000 | 94 000 | 127 000 |
| Technical committees, advisory groups | 55 626 | 59 000 | – | (59 000) | (59 000) | – | – | – |
| Representation and hospitality | 1 606 | 3 500 | 200 | – | 200 | 3 700 | 5 000 | 6 000 |
| Scientific and technical contracts | 546 370 | 430 000 | 32 000 | (19 000) | 13 000 | 443 000 | 680 000 | 740 000 |
| Common services, supplies and equipment | 1 514 | 6 300 | 200 | – | 200 | 6 500 | 8 000 | 8 000 |
| Other items of expenditure | – | – | – | – | – | – | 4 000 | 5 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 85 749 | 175 000 | 10 000 | (7 000) | 3 000 | 178 000 | 196 000 | 217 000 |
| Printing and publishing services | 257 594 | 394 000 | 44 000 | (18 000) | 26 000 | 420 000 | 449 000 | 519 000 |
| Data processing services | 10 112 | 32 000 | (1 500) | 11 500 | 10 000 | 42 000 | 45 000 | 50 000 |
| Laboratory services | 1 174 029 | 1 381 000 | 114 000 | (109 000) | 5 000 | 1 386 000 | 1 520 000 | 1 605 000 |
| Conference services | – | 35 000 | 2 800 | 2 200 | 5 000 | 40 000 | 26 000 | 30 000 |
| TOTAL | 3 183 953 | 3 865 000 | 317 600 | (163 600) | 154 000 | 4 019 000 | 4 512 000 | 4 887 000 |

## SUMMARY OF MANPOWER

Table F.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | – (1)[a] | – (1) | – (1) | – | – (1) | – (1) | – (1) |
| P-5 | 8 (2) | 8 (2) | 8 (2) | – | 8 (2) | 7 (2) | 7 (2) |
| P-4 | 6 (3) | 6 (3) | 6 (3) | – | 6 (3) | 6 (3) | 6 (3) |
| P-3 | 1 (–) | 1 (–) | 1 (–) | – | 1 (–) | 1 (–) | 1 (–) |
| P-2 | 1 (–) | 1 (–) | 1 (–) | – | 1 (–) | 1 (–) | 1 (–) |
| Sub-total | 16 (6) | 16 (6) | 16 (6) | – | 16 (6) | 15 (6) | 15 (6) |
| GS | 8 (6) | 8 (6) | 8 (6) | – | 8 (6) | 8 (6) | 8 (6) |
| TOTAL | 24 (12) | 24 (12) | 24 (12) | – | 24 (12) | 23 (12) | 23 (12) |

[a] FAO staff in brackets.

## Contribution by FAO towards the financing of the activities of the Joint FAO/IAEA Division

Table F.3

| | Budget 1978–79 | Estimates 1980–81 |
|---|---|---|
| Salaries and common staff costs for Professional staff[a] | 650 000 | 650 000 |
| Consultants | 60 000 | 65 000 |
| Duty travel | 30 000 | 34 000 |
| Contractual services and equipment[a] | 335 000 | 766 000 |
| Operating expenses | 27 000 | 32 000 |
| Publications | 56 000 | 71 000 |
| TOTAL | 1 158 000 | 1 618 000 |

[a] The cost of meetings is included under Salaries and common staff costs and Contractual services on the basis of CCAQ's expenditure classification.

## CHANGES IN COSTS AND MANPOWER

### Costs

F/1. As will be seen from Table F.1 above, it is expected that the cost of this programme will increase by $154 000 as a net result of salary and other price increases of $ 317 600 partly offset by a programme decrease of $163 600.

F/2. It is planned to hold two symposia and one seminar in 1981, compared with two meetings in this category in the 1980 budget; the programme increase is only $5 000. Since it is planned to replace technical committees and advisory groups by consultants' meetings in future, there is a programme decrease of $59 000 under technical committees and advisory groups and a programme increase of $30 000 in respect of consultants' services. A programme decrease of $19 000 is foreseen in respect of scientific and technical contracts, mainly under the "Food preservation" sub-programme.

F/3. As regards the allocation of service costs, there will be programme decreases in respect of linguistic services ($7 000), printing and publishing services ($18 000) and laboratory services ($109 000). Programme increases are foreseen in respect of data processing services ($11 500) and conference services ($2 200).

F/4. It is expected that the contribution by FAO towards the financing of the activities of the Joint FAO/IAEA Division will be $1 618 000 for the two-year period 1980–81, as shown in Table F.3 above.

F/5. As can be seen from Table 1 (CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–81), it is expected that Sweden will support the research contracts programme with a contribution of $345 000. It is also expected that the Federal Republic of Germany will contribute an amount of $90 000 for activities relating to nitrogen residues. The United States will contribute $80 000 in support of insect and pest control.

### Manpower

F/6. No change in manpower is foreseen for 1981. In 1982, it will be possible to relinquish one P-5 post in the "Food preservation" sub-programme.

## THE PROGRAMME

### OBJECTIVE

F/7. The objective is to foster applications of isotopes and radiation related to food and agriculture under a joint FAO/Agency programme aimed at increasing the ability of developing countries to apply nuclear techniques (when necessary in combination with other advanced methods) in research and development, so as economically to increase agricultural production, reduce post-harvest losses and minimize pollution of food and the environment.

### STRUCTURE

F/8. This programme consists of six sub-programmes, which are dealt with separately below (Advisory Groups are referred to as "expert panels" in the programme of FAO).

## Summary of manpower and costs by sub-programme

Table F.4

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | Man-years | | Costs | Man-years | | Costs |
| | P | GS | | P | GS | | P | GS | |
| Soil fertility, irrigation and crop production | 4.2 (0.2)[a] | 1.4 (1.1) | 885 000 | 4.2 (0.2) | 1.4 (1.1) | 1 005 000 | 4.2 (0.2) | 1.4 (1.1) | 1 082 000 |
| Plant breeding and genetics | 2.2 (1.2) | 1.4 (1.2) | 874 000 | 2.2 (1.2) | 1.4 (1.2) | 895 000 | 2.2 (1.2) | 1.4 (1.2) | 974 000 |
| Animal production and health | 1.2 (1.1) | 1.3 (0.2) | 316 000 | 1.2 (1.1) | 1.3 (0.2) | 360 000 | 1.2 (1.1) | 1.3 (0.2) | 391 000 |
| Insect and pest control | 2.1 (1.2) | 1.3 (1.2) | 1 097 000 | 2.1 (1.2) | 1.3 (1.2) | 1 339 000 | 2.1 (1.2) | 1.3 (1.2) | 1 454 000 |
| Chemical residues and pollution | 1.2 (2.1) | 2.2 (0.2) | 262 000 | 1.2 (2.1) | 2.2 (0.2) | 392 000 | 1.2 (2.1) | 2.2 (0.2) | 419 000 |
| Food preservation | 5.1 (0.2) | 0.4 (2.1) | 585 000 | 4.1 (0.2) | 0.4 (2.1) | 521 000 | 4.1 (0.2) | 0.4 (2.1) | 567 000 |
| TOTAL | 16.0 (6.0) | 8.0 (6.0) | 4 019 000 | 15.0 (6.0) | 8.0 (6.0) | 4 512 000 | 15.0 (6.0) | 8.0 (6.0) | 4 887 000 |

[a] FAO staff in brackets.

## SUB-PROGRAMME F.1

### Soil fertility, irrigation and crop production

#### OBJECTIVE

F.1/1. The objective is to advise and assist Member States of the Agency and FAO in connection with the application of isotope and radiation techniques in problem-oriented research on soil fertility, crop production and irrigation, and in the improvement of soil and water management practices in both rainfed and irrigated agriculture with a view to increasing crop production in the most economical way.

#### OUTLINE FOR 1981–86

F.1/2. Research projects (implemented mainly through co-ordinated research programmes) relating to the efficiency of fertilizer and water utilization by agricultural crops will continue. The current programmes on agricultural nitrogen residues, biological dinitrogen fixation and the development of adequate water and fertilizer management practices under rainfed farming conditions will continue until 1983.

F.1/3. During 1980, a new programme aimed at the development of efficient fertilizer and water management practices for multiple cropping systems has been initiated. In the early stages of this programme, emphasis will be given to row intercropping of a cereal (maize or sorghum) and a legume crop. Another programme to study the role of herbicides and related chemicals in soil and fertilizer nitrogen management is to be initiated in 1980 in co-operation with the "Chemical residues and pollution" sub-programme. These two studies will be continued until 1985. It is planned to start in 1981 a programme for developing fertilizer and water management practices aimed at improving pastures; this will be implemented in co-operation with the "Animal production and health" sub-programme and will continue until 1986. It is further envisaged to formulate in 1981 and initiate in 1982 a programme on fertilizer and water management practices for specific tree crops. In 1983, a project relating to the effects of water quality on the water requirements of crops will be started.

F.1/4. It is planned to hold annual training courses on the use of isotopes and radiation techniques in soil-water-plant research; specialized courses in nitrogen-15 analysis involving mass and emission spectrometry and isotope applications in soil moisture and irrigation studies will be held in alternate years.

#### STRUCTURE

F.1/5. This sub-programme (with which over 25 technical assistance projects are associated at present) consists of four components, which are described in the following paragraphs.

## Soil fertility, irrigation and crop production

### Summary by programme components

Table F.5

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Use of isotopes and radiation in studies on plant nutrition and fertilizer application | 1.3 (0.1)[a] | 0.4 (0.3) | 108 200 | – | 35 000 | 1 800 | 145 000 |
| Use of isotopes and radiation in studies of soil-water regimes | 1.3 (–) | 0.4 (0.3) | 92 900 | – | 20 000 | 1 100 | 114 000 |
| Use of isotopes and radiation in studies of ion and water movement in soils | 1.3 (0.1) | 0.4 (0.3) | 92 900 | – | 10 000 | 1 100 | 104 000 |
| Use of nuclear techniques in improving pasture management and animal production practices | 0.3 (–) | 0.2 (0.2) | 8 200 | – | 10 000 | 800 | 19 000 |
| Linguistic services | – | – | – | – | – | 40 000 | 40 000 |
| Printing and publishing services | – | – | – | – | – | 124 000 | 124 000 |
| Data processing services | – | – | – | – | – | 6 000 | 6 000 |
| Laboratory services | – | – | – | – | – | 333 000 | 333 000 |
| TOTAL | 4.2 (0.2) | 1.4 (1.1) | 302 200 | – | 75 000 | 507 800 | 885 000 |

[a] FAO staff in brackets.

## Use of isotopes and radiation in studies on plant nutrition and fertilizer application (component F.1.1)

### Objective

F.1.1/1. The objective is to investigate the role of microbiological processes in supplying plants with nitrogen, both symbiotically and non-symbiotically (1978–83); to develop efficient fertilizer and water management practices for different cropping systems, including trees (1980–85); and to study the role of herbicides and related chemicals in soil and fertilizer nitrogen management (in collaboration with the "Chemical residues and pollution" sub-programme (1980–85).

### Results to date

F.1.1/2. The co-ordinated research programme on isotope-aided micronutrient studies in rice production with special reference to zinc deficiency was concluded in 1979. The work included quantitative evaluation of different zinc fertilizer practices. The results are to be published in the Agency's Technical Reports Series in 1980.

F.1.1/3. In the co-ordinated programme on dinitrogen fixation, which is supported by SIDA, a field experiment has been carried out by 15 participants to refine the methodology for the quantitative measurement of the amounts of $N_2$ fixed during the growing season of leguminous crops (Table F.11, No.3). The initial results were presented at a research co-ordination meeting in Vienna this year.

F.1.1/4. A co-ordinated research programme on the use of nuclear techniques in the development of fertilizer and water management practices for multiple cropping systems was established in 1980 (Table F.11, No.1). An FAO/IAEA Advisory Group meeting held in Ankara in 1979 established the objectives and the scientific scope of this programme. Another important outcome of the meeting was the elaboration of the experimental approach needed to determine, with the aid of isotope techniques, where and when to apply nitrogen and phosphorus fertilizers for most effective utilization in a multiple cropping system.

Plans for 1981–82

F.1.1/5. The dinitrogen fixation co-ordinated research programme will be directed towards studying the effects of different management practices on dinitrogen fixation in the field and defining the most favourable conditions for this process (Table F.11, No.3).

F.1.1/6. A co-ordinated research programme aimed at the development of efficient water and fertilizer management practices for multiple cropping systems was initiated in 1980 (Table F.11, No.1). In the early stages of the programme, emphasis will be given to a row intercropping system of alternate rows of a cereal (maize or sorghum) and a legume crop.

F.1.1/7. It is planned to formulate a programme on fertilizer and water management practices for specific tree crops (Table F.12, No.1). The programme will be initiated in 1982.

Related activities

F.1.1/8. The Agency's Laboratory will carry out supporting research, provide training in methodology and perform nitrogen-15 and other determinations for this component.

Co-operation with other organizations

F.1.1/9. This programme component involves co-operation with UNDP, SIDA, IRRI, ESNA, ICRISAT, IITA, ICARDA and the International Soil Science Society.

## Use of isotopes and radiation in studies of soil-water regimes (component F.1.2)

Objective

F.1.2/1. The objective is to develop efficient water management practices under rainfed farming conditions in semi-arid areas (1979–84) and to examine the effects of water quality on crop water requirements (1983–88).

Plans for 1981–82

F.1.2/2. A co-ordinated research programme on the use of isotope and radiation techniques to achieve more efficient water and fertilizer use and to develop adequate water conservation measures under rainfed farming conditions in semi-arid regions was initiated in 1977/78 and work on this will be continued (Table F.11, No.4).

Outline of changes during 1983–86

F.1.2/3. In 1983, it is planned to initiate a new co-ordinated research programme to examine the effects of water quality on yields and crop water requirements, with special reference to saline and salt-affected soils and to the management of salt accumulation, including the development of leaching methods.

Related activities

F.1.2/4. An intensive training course on the use of radiation equipment in soil moisture and irrigation studies for French-speaking technicians is to be held this year.

Co-operation with other organizations

F.1.2/5. This programme component involves co-operation with ICARDA, ACSAD and UNDP.

Use of isotopes and radiation in studies of ion and water movement in soils (component F.1.3)

Objective

F.1.3/1. The objective is to develop (in collaboration with the "Chemical residues and pollution" sub-programme) water and soil management practices which will maximize the utilization of fertilizer nitrogen residues by crops (1980–83).

Results to date

F.1.3/2. Work has been directed towards understanding the long-term fate of fertilizer nitrogen in the soil-air-water-plant ecosystem. A co-ordinated research programme supported by the Government of the Federal Republic of Germany (through GSF) is being conducted in collaboration with the "Chemical residues and pollution" sub-programme (Table F.11, No.7). Experiments have been carried out under different soil and climatic conditions, with various crops and different soil and water management practices. Results indicate that only 20–70% of the plant nitrogen is derived from the fertilizer during the first year after application, less than 7% in the second year and about 1% in the third year. Fertilizer nitrogen sometimes appears as nitrate more than 200 cm below the soil surface; in other cases there is no significant nitrogen leaching. Useful progress has been made in the development of methodology and models for predicting fertilizer nitrogen losses through leaching.

Plans for 1981–82

F.1.3/3. In view of the importance of this programme for agricultural practices, the agreement between the Agency and GSF has been extended until 1983 and the co-ordinated research programme will be continued.

Related activities

F.1.3/4. The Agency's Laboratory will undertake supporting research, provide training and assist contractors with analyses.

Co-operation with other organizations

F.1.3/5. This programme component involves co-operation with UNDP, GSF, ICRISAT and EAAFRO.

Use of nuclear techniques in improving pasture management and animal production practices (component F.1.4)

Objective

F.1.4/1. The objective is to develop (in collaboration with the "Animal production and health" sub-programme) fertilizer and water management practices for improving pastures in order to optimize animal nutrition (1981–86).

Plans for 1981–82

F.1.4/2. A detailed technical programme and an experimental approach (including the use of isotopic tracer techniques) for improving forage production through better fertilizer and water management practices will be formulated in 1980 through an FAO/IAEA Advisory Group. This work will be carried out through a co-ordinated research programme, to be initiated in 1981, in which approximately ten institutions in Member States will participate. In the initial stages of the programme, emphasis will be placed on studying the efficiency of forage legumes as suppliers of nitrogen for the soil-plant-animal system in improved pastures. The potential benefits of improved pastures in terms of animal nutrition will be examined in collaboration with the "Animal production and health" sub-programme.

Related activities

F.1.4/3. The Agency's Laboratory will provide training in methodology and assist contractors with analyses.

Co-operation with other organizations

F.1.4/4. This programme component will involve co-operation with UNDP, UNEP, ICARDA, ICRISAT and ACSAD.

## SUB-PROGRAMME F.2

### Plant breeding and genetics

OBJECTIVE

F.2/1. The objective is to assist and advise Member States of the Agency and FAO on the use of radiation and isotope techniques for the genetic improvement of crop plants.

OUTLINE FOR 1981–86

F.2/2. Research, to be supported mainly through the mechanism of co-ordinated research programmes, will focus on the technology needed to supply plant breeders with useful genetic resources from mutation induction for the ever-continuing efforts to improve cultivated plants. The technology comprises: (i) mutation induction, where more efficient methods with a higher output of useful mutants are sought and known methods have to be adapted to various plant species; (ii) mutant selection, where screening methods for a wide array of desirable traits need to be developed; and (iii) mutant use, where mutants have to be developed into varieties, often by recombining valuable characteristics through cross breeding. Priority will be given to achieving greater yields, higher resistance to diseases and pests and better nutritional quality in major crop plants. Technological research will take advantage of progress in genetics, plant physiology, biochemistry, plant pathology and in vitro culture work. Training will be offered on various aspects of mutation breeding methodology.

STRUCTURE

F.2/3. This sub-programme (with which about ten technical assistance projects are associated at present) consists of four components, which are described in the following paragraphs.

## Plant breeding and genetics

### Summary by programme components

Table F.6

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Grain protein improvement by means of nuclear techniques | 0.6 (0.3)[a] | 0.4 (0.3) | 55 600 | – | 20 000 | 1 400 | 77 000 |
| Disease and pest resistance of crop plants | 0.6 (0.3) | 0.4 (0,3) | 54 900 | – | 20 000 | 2 100 | 77 000 |
| Crop improvement through induced mutations | 0.5 (0.3) | 0.3 (0.3) | 48 800 | 31 000 | 20 000 | 1 200 | 101 000 |
| Development of induced mutation technology | 0.5 (0.3) | 0.3 (0.3) | 51 700 | – | 10 000 | 1 300 | 63 000 |
| Linguistic services | – | – | – | – | – | 40 000 | 40 000 |
| Printing and publishing services | – | – | – | – | – | 124 000 | 124 000 |
| Data processing services | – | – | – | – | – | 30 000 | 30 000 |
| Laboratory services | – | – | – | – | – | 347 000 | 347 000 |
| Conference services | – | – | – | – | – | 15 000 | 15 000 |
| TOTAL | 2.2 (1.2) | 1.4 (1.2) | 211 000 | 31 000 | 70 000 | 562 000 | 874 000 |

[a] FAO staff in brackets.

### Grain protein improvement by means of nuclear techniques (component F.2.1)

#### Objective

F.2.1/1. The objective is to increase the nutritional value of cereal grains by raising the protein content and improving the protein quality through mutation induction (1969–81), to evaluate selected mutants genetically, nutritionally and agronomically and to utilize them in cross breeding (1972–82).

#### Results to date

F.2.1/2. Mutants of barley, rice and wheat with improved protein content have been obtained in the course of a co-ordinated research programme supported by the Federal Republic of Germany and are now being used in cross breeding in at least 11 countries (Table F.11, No.14). Efficient analytical techniques for use in plant breeding programmes have been developed. Results were reviewed at an international FAO/IAEA/GSF symposium in 1978 in the context of other national and international efforts directed towards the same objective.

#### Plans for 1981–82

F.2.1/3. In addition to the support from the Federal Republic of Germany, the Government of Sweden has agreed to provide financial support through SIDA for an extension of the co-ordinated research programme until 1982. Approximately 20 institutes will continue to co-operate, under this tri-partite programme, in the development of advanced breeding material and potential cultivars.

#### Related activities

F.2.1/4. The Agency's Laboratory will support projects by providing analytical services, training and advice.

Outline of changes during 1983–86

F.2.1/5. The valuable genetic stocks developed will be handed over to Member States and international institutions for further use in cross breeding.

Co-operation with other organizations

F.2.1/6. This programme component involves co-operation with GSF, SIDA, USDA, USDOE and several international agricultural research centres.

## Disease and pest resistance of crop plants (component F.2.2)

Objective

F.2.2/1. The objective is to create, through mutagenesis, genetic variability for selecting crop plants with improved disease resistance (1977–84) and with improved resistance to disease vectors and harmful insects (1979–89) (in collaboration with the "Insect and pest control" sub-programme).

Results to date

F.2.2/2. This programme component evolved from recommendations made by a panel of experts in 1970. A co-ordinated research programme (Table F.11, No.15) established in 1971 under SIDA sponsorship made a substantial advance in mutation breeding for disease resistance and led to genetic stocks with improved disease resistance in wheat, rice, barley, oats and millet in Brazil, Czechoslovakia, Denmark, India and the United States. After 1978, a follow-up programme was started with SIDA support to focus on improving disease resistance in leguminous crop plants (Table F.11, No.19). The results were reviewed at an FAO/IAEA/SIDA symposium in 1977. Work on resistance to insect pests emerged from an Advisory Group meeting in 1977 in Senegal. This work is carried out on a limited scale, but it has already been successful in producing rice with improved resistance to the brown plant hopper.

Plans for 1981–82

F.2.2/3. In the expectation of continued SIDA support, the work under the co-ordinated research programme on improving disease and insect pest resistance in cultivated plants will be continued and expanded (Table F.11, No.19).

Related activities

F.2.2/4. The Agency's Laboratory will provide support through mutagen treatment services, methodological research and training. The Entomology Section of the Laboratory will render assistance when necessary.

Outline of changes during 1983–86

F.2.2/5. Work on developing genetic resistance to damaging insects and other disease vectors is planned for a ten-year period; this will involve approximately 20 research institutes concerned with different crop plants, different disease and pest problems, and different aspects of resistance.

Co-operation with other organizations

F.2.2/6. This programme component involves co-operation with several national and international integrated plant protection programmes (such as those co-ordinated by UNEP), IOBC, the International Biological Programme, USDA and international agricultural research centres.

## Crop improvement through induced mutations (component F.2.3)

### Objective

F.2.3/1. The objective is to induce mutations and evaluate mutants having improved characteristics and to use them in developing improved cultivars, with emphasis on improving vegetatively propagated plants and woody perennials through genetic mutations (1972–82), improving productivity components of grain legumes and oil crops (1977–84) and broadening the genetic basis for short-stature cereals (1980–85); and to collect information about valuable mutant stocks and disseminate it through the "Mutation Breeding Newsletter" (1972-continuing).

### Results to date

F.2.3/2. More than 60 crop plant varieties developed by using induced mutants have been officially released in 23 Member States since 1975. Numerous mutants are available as germ plasm for cross breeding.

F.2.3/3. As a result of the Agency's long-term co-ordination and support of rice mutation projects, economic gains are being achieved from rice mutant varieties in Bangladesh, Hungary, India, Japan, Pakistan, Thailand and the United States. Of similar economic importance are groundnut, sugar cane and castor bean mutants in India, barley mutants in Czechoslovakia, the German Democratic Republic and Sweden and wheat mutants in Italy and the Soviet Union.

F.2.3/4. The "Mutation Breeding Newsletter", issued twice a year, has continued to inform scientists and practical plant breeders of advances in mutation and selection technology, of available improved genetic stocks and of mutant-derived varieties released for commercial use.

### Plans for 1981–82

F.2.3/5. The co-ordinated research programme aimed at increasing the production of grain legumes in South East Asia is planned to continue at least until 1981–82 (Table F.11, No.17). Research work on the improvement of vegetatively propagated plants and woody perennials, which requires a particularly long programme duration, is planned to focus more specifically on root and tuber crops of importance to developing countries through a new co-ordinated research programme to be initiated in 1982.

F.2.3/6. It is planned to start co-ordinated research programmes on the genetic diversification of crop plants and the incorporation of desired mutant genes into suitable highly productive genotypes. A co-ordinated research programme for improving oil seed and other industrial crops is also to be initiated (following the recommendations of an FAO/IAEA Advisory Group in 1980).

F.2.3/7. An FAO/IAEA symposium will be held in 1981 to review the contribution which plant mutation research has made to the development of better cultivars (Annex I (7)). An FAO/IAEA regional seminar will be held in 1982 to help keep plant breeders in Latin America informed of current methods for using induced mutations in plant breeding (Annex II (8)).

### Outline of changes during 1983–86

F.2.3/8. Subject to the availability of funds, two training courses, one study tour and one symposium relating to the improvement of crops through mutation induction will be organized.

### Co-operation with other organizations

F.2.3/9. This programme component involves co-operation with EUCARPIA, SABRAO and other plant-breeding/plant genetics associations.

## Development of induced mutation technology (component F.2.4)

### Objective

F.2.4/1. The objective is to gain insight into mutagen action on plant material; to develop appropriate techniques for detecting mutants with improved characteristics and to examine the genetic basis of mutated traits (1969-continuing); and to develop *in vitro* methods for mutation induction and mutant selection and find ways of altering traits with cytoplasmic inheritance (1977–87).

### Results to date

F.2.4/2. Mutagen treatments of different plant species and different plant organs require a knowledge of the sensitivity of the plant material, of ways of applying mutagens, of methods for controlling modifying factors and of standardized means for assessing the effectiveness of mutagenesis. In all these areas, useful results have been obtained by research institutes in Member States and by the Agency's Laboratory. Powerful new mutagens have been discovered and methods for the safe handling of these dangerous compounds have been worked out and published in the 1977 revised edition of the "Manual on Mutation Breeding" (published in the Agency's Technical Reports Series).

### Plans for 1981–82

F.2.4/3. A review of the state of knowledge concerning the induction of mutations in genetic traits inherited in ways other than through chromosomes will be made and guidelines for Agency action formulated with the assistance of consultants (Table F.12, No.2). These plans are to be carried out through training and research projects in Member States and at the Agency's Laboratory.

F.2.4/4. Research work to advance technology for crop improvement through mutation induction will be stimulated under co-ordinated research programmes to be initiated with practical breeding objectives. Guidelines on the objectives of the programme will be formulated with the assistance of consultants (Table F.12, No.3).

### Related activities

F.2.4/5. Subject to the availability of funds and facilities, training courses on mutation breeding technology will be held at the Agency's Laboratory.

F.2.4/6. The Agency's Laboratory will continue to carry out supporting research on plant mutagenesis, will provide mutagen treatment services and will offer various types of training.

### Outline of changes during 1983–86

F.2.4/7. More emphasis will be placed on mutation techniques involving haploid plants and *in vitro* cultures.

### Co-operation with other organizations

F.2.4/8. This programme component involves co-operation with EURATOM, ESNA, the Indian Society for Nuclear Techniques in Agriculture and Biology and various plant genetics associations.

## SUB-PROGRAMME F.3

### Animal production and health

### OBJECTIVE

F.3/1. The objective is to assist and advise Member States of the Agency and FAO in connection with the use of nuclear techniques for the solution of animal production and disease problems, including problems associated with nutrition, reproduction and adaptation to the environment.

### OUTLINE FOR 1981–86

F.3/2. A study (carried out mainly under a co-ordinated research programme) of isotope-aided techniques for detecting moderate mineral imbalances in livestock is to be completed during 1980, and animal production studies will concentrate on improving reproductive performance. Isotope studies on non-protein nitrogen and protein nitrogen nutrition of ruminants will be expanded. Studies on parasitic diseases of livestock, initially centered on tick-borne diseases, will be expanded to include other protozoal and helminthic diseases (e.g. trypanosomiasis and haemonchosis) and to deal with resistance in some breeds and strains of livestock and the connection with climate and nutrition.

### STRUCTURE

F.3/3. This sub-programme (with which about 18 technical assistance projects are associated at present) consists of two components, which are described in the following paragraphs.

### Animal production and health

Summary by programme components

Table F.7

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Isotope techniques in animal nutrition and physiology | 0.6 (0.6)[a] | 0.7 (0.1) | 73 400 | – | 43 000 | 3 600 | 120 000 |
| Nuclear techniques in animal parasitology and disease control | 0.6 (0.5) | 0.6 (0.1) | 80 900 | – | 40 000 | 4 100 | 125 000 |
| Linguistic services | – | – | – | – | – | 26 000 | 26 000 |
| Printing and publishing services | – | – | – | – | – | 43 000 | 43 000 |
| Data processing services | – | – | – | – | – | 2 000 | 2 000 |
| TOTAL | 1.2 (1.1) | 1.3 (0.2) | 154 300 | – | 83 000 | 78 700 | 316 000 |

[a] FAO staff in brackets.

## Isotope techniques in animal nutrition and physiology (component F.3.1)

### Objective

F.3.1/1. The objectives are: to develop methods for detecting moderate mineral imbalances (1976–81); to evaluate hormonal disfunctions in relation to reproduction capabilities in farm animals (1977–82); to improve the nutrition, health and reproductive performance of domestic buffalo in order to enhance meat and milk production and draught performance (1975–84); to improve the efficiency of utilization of non-protein supplements and true dietary protein in ruminants fed with agro-industrial by-products (1981–86); and to optimize animal nutrition through pasture improvement (in collaboration with the "Soil fertility, irrigation and crop production" sub-programme) (1981–86).

### Results to date

F.3.1/2. The final meeting of the co-ordinated research programme on detecting moderate mineral imbalances was held in 1980 (Table F.11, No.22). The programme resulted in the compilation of important information on the absorption, metabolism and excretion of minerals; no single, simple, reliable technique to assess imbalance was found for any of the minerals studied. The broad-based programme involving livestock production has provided results which are important to the development of agriculture. In 1980 there is to be a re-orientation of this programme towards a study of progesterone and reproduction potential with emphasis on ruminants in Latin America and parts of Africa. A research co-ordination meeting was held in 1979 on domestic buffalo improvement in Asia (RCA), a multi-disciplinary programme aimed at improving the utilization of dietary non-protein nitrogen and protein nitrogen, increasing fertility (by methods involving progesterone measurements) and controlling parasitic diseases (Table F.11, No.20).

F.3.1/3. Two training courses were held in 1979: one general course on isotopes in animal nutrition and production (United States of America) and a specialized course on radioimmunoassay (RIA) techniques in animal production (Cuba). A specialized training course, supported by DANIDA, on nutrition with particular reference to mineral metabolism is planned for 1980 in Turkey.

### Plans for 1981–82

F.3.1/4. A training manual will be published in 1981 on the use of RIA techniques in studies of animal reproduction for use by scientists in developing Member States engaged in efforts to increase livestock numbers. The co-ordinated research programme on moderate mineral imbalances will terminate in 1981 and a technical report will be issued in 1982 containing practical results, conclusions and recommendations (Table F.11, No.22). A new co-ordinated research programme will be initiated in 1981 on the utilization of dietary non-protein nitrogen and true protein for improving milk and meat production in ruminants fed low-quality roughage diet.

F.3.1/5. The on-going co-ordinated research programme using hormonal assay in efforts to improve fertility and reproductive performance of ruminants will continue, with greater emphasis on Latin America and Africa (Table F.11, No. 21). The scope of work under a co-ordinated programme on isotope studies of the utilization of agro-industrial wastes by buffalo, a component of the multi-disciplinary programme to improve domestic buffalo production in Asia, will be expanded (Table F.11, No.20). A co-ordinated research programme to improve the nutrition of grazing animals through pasture improvement will be initiated in 1981. A study of the role of isotopes in identifying productive breeds and strains of animal in dry and wet tropical areas will be made with the help of consultants (Table F.12, No.4).

F.3.1/6. The prospects for using radioisotope techniques to improve fishery production will be investigated in 1981.

### Related activities

F.3.1/7. International training courses in animal nutrition and the use of RIA techniques in animal reproduction studies are planned.

### Outline of changes during 1983–86

F.3.1/8. The programmes will be consolidated as far as possible into multi-disciplinary programmes, not only within this component but also within that related to disease control. In this way, the interaction between level of nutrition

and reproduction performance and resistance to parasitic diseases can be assessed. Progesterone assay will, where possible, be associated with herd recording and national artificial breeding schemes.

Co-operation with other organizations

F.3.1/9. This sub-programme component involves co-operation with UNDP, SIDA, DANIDA, ILCA and the FAO/SIDA training courses in animal reproduction.

Nuclear techniques in animal parasitology and disease control (component F.3.2)

Objective

F.3.2/1. The objective is to investigate the immunological and pathogenic effects of tick and tick-borne diseases and devise control measures against them (1979–84); to identify animal breeds resistant to helminths and protozoal parasitic diseases and the variations in resistance associated with nutritional and other variables (1981–86); to study ways of improving the reproductive efficiency and resistance of cattle in Latin America (1983–88); and to study nutrition, reproductive performance and disease tolerance in small ruminants in Africa for the improvement of meat and milk production (1983–88).

Results to date

F.3.2/2. Previous co-ordinated research programmes in parasitology have demonstrated the value of isotopes and radiation in the study of the pathophysiological and immunological response of hosts to parasitic infections, particularly in regard to comparative studies of the disease resistance of different breeds and strains of animals. The first research co-ordination meeting of the programme on tick and tick-borne diseases (Table F.11, No.23) recommended that attempts be made to vaccinate against tick-borne diseases with irradiated infective organisms and that studies on the immunological and pathophysiological consequences of infection be supported. This meeting was held in conjunction with an FAO/IAEA symposium on vector-borne diseases of livestock, which was organized jointly with the "Insect and pest control" and "Chemical residues and pollution" sub-programmes in 1979. An FAO/IAEA Advisory Group meeting was held at Cambridge, United Kingdom, in 1979 to outline a programme on the influence of genotype and nutrition on the pathogenesis of parasitic infections and their control.

Plans for 1981–82

F.3.2/3. The co-ordinated research programme on tick and tick-borne diseases (Table F.11, No.23) will be expanded and isotope-aided studies on the comparative resistance of tolerant and non-tolerant breeds of livestock to trypanosomiasis, haemonchosis and other important tropical parasitic diseases will receive greater attention. Studies of significant parasitic diseases of the buffalo (e.g. neoascaris) in Asia will be emphasized under the existing co-ordinated programme (Table F.11, No. 20).

Related activities

F.3.2/4. A training course on isotope techniques in parasitology and immunology, supported by SIDA, was held at ILRAD (Kenya) in 1979; a further course is planned for 1981.

F.3.2/5. Technical assistance projects on pathophysiological and immunological effects of parasitic diseases on the host will be supported. Trials for studying vaccine efficacy against lungworm infection will continue in several countries, e.g. Brazil, Ethiopia, India, Peru, Sri Lanka, Sudan and Turkey.

Outline of changes during 1983–86

F.3.2/6. Expansion of work on the comparative resistance of different breeds and strains of cattle, sheep and goats is planned (using isotopic techniques to assess pathophysiological differences), particularly for Africa and Latin America, and greater emphasis will be placed on studies to control the parasitic diseases in the buffalo. Experimental vaccination trials against tick-borne diseases (babesiosis, anaplasmosis) using radiation-attenuated vaccines may be started.

Co-operation with other organizations

F.3.2/7. This component involves co-operation with UNDP, ILRAD, the Ministry of Overseas Development (United Kingdom) and SIDA.

## SUB-PROGRAMME F.4

### Insect and pest control

OBJECTIVE

F.4/1. The objective is to assist and advise Member States of the Agency and FAO in connection with the development of insect and pest control programmes involving radiation and isotopes, insect control being the subject of the sub-programme at present.

OUTLINE FOR 1981–86

F.4/2. The programme for the control of tsetse flies by the sterile-insect technique (SIT) will continue. The Agency is involved in a five-year (1977–82) co-operative field project with the Government of Nigeria (BICOT)* with the aim of investigating the advantages, efficacy and financial benefits of SIT for the control or eradication of a riverine species of tsetse fly. The BICOT facility is located at the National Veterinary Research Institute in Vom, Plateau State, and became operational at the beginning of 1979. It contains a large insectary capable of producing the insects required for the programme, together with irradiation, research and animal buildings. The ultimate objective of the project is to establish the required expertise and facilities for economical application of the SIT to tsetse flies. Tsetse fly rearing technology has advanced at a fast pace and the latest ideas are being applied in the BICOT project, which is at present supported by Belgium, the Federal Republic of Germany and the United Kingdom. In addition to this work, the Agency's Laboratory staff will continue to provide research and technical support to several tsetse fly projects in other African countries.

F.4/3. The programme for the application of isotopes in pest management with emphasis on rice insects will be more fully developed during this period. An isotope research and training facility is available in the Entomology Section of the Agency's Laboratory in support of this programme.

F.4/4. Research contracts on the genetic sexing of the Mediterranean fruit fly (medfly) were initiated in 1980. The programme will include the refining of mass rearing methods, and the development of quality control techniques and aerial release methodologies in support of the Mexican medfly project. The emphasis will be placed on the application of SIT for medfly control in the context of insect pest management.

F.4/5. The information circular "Radiation Techniques and their Application to Insect Pests" will continue, its coverage including mechanisms for the genetic control of plant and animal insect pests, the use of isotopes in pest management and mutation breeding for resistance to insects.

F.4/6. With consultant assistance in 1981, the development of sexing mechanisms for the mass rearing of insects will be explored (Table F.12, No.5). An FAO/IAEA symposium on SIT and the use of radiation in genetic insect control is to be held in 1981 (Annex I (8)).

F.4/7. International training courses are planned on the use of isotopes and radiation and on the mass rearing of fruit flies.

STRUCTURE

F.4/8. This sub-programme consists of three components, which are described in the following paragraphs.

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* IAEA/Government of Nigeria Project on the Biological Control of Tsetse Flies by the Sterile Insect Technique.

Summary by programme components

Table F.8

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Development of the sterile-insect technique against fruit flies | 0.8 (0.4)[a] | 0.5 (0.4) | 74 700 | – | 20 000 | 1 300 | 96 000 |
| Development of the sterile-insect technique against the tsetse fly and other biting flies | 0.7 (0.4) | 0.5 (0.4) | 65 800 | – | 20 000 | 1 200 | 87 000 |
| Use of isotopes and radiation in developing insect pest management | 0.6 (0.4) | 0.3 (0.4) | 62 100 | 31 000 | 30 000 | 2 900 | 126 000 |
| Linguistic services | – | – | – | – | – | 20 000 | 20 000 |
| Printing and publishing services | – | – | – | – | – | 43 000 | 43 000 |
| Data processing services | – | – | – | – | – | 4 000 | 4 000 |
| Laboratory services | – | – | – | – | – | 706 000 | 706 000 |
| Conference services | – | – | – | – | – | 15 000 | 15 000 |
| TOTAL | 2.1 (1.2) | 1.3 (1.2) | 202 600 | 31 000 | 70 000 | 793 400 | 1 097 000 |

[a] FAO staff in brackets.

## Development of the sterile-insect technique against fruit flies (component F.4.1)

### Objective

F.4.1/1. The objective is to assist in applying the sterile-insect technique on a large scale against fruit flies, to develop methods for optimizing its application (1968–83) and to develop genetic sexing methods for these insects (1979–83).

### Results to date

F.4.1/2. The effective exclusion or control of fruit flies by SIT has been demonstrated in several countries. A large-scale project, to which FAO and the Agency have contributed significantly in terms of research and development, is currently in progress involving the Governments of Mexico and the United States. The project began formally with an agreement in 1977 between the Agency and the United States Government to produce over a period of twelve months 30 million irradiated medfly pupae per week to be shipped to Central America for the purpose of training Mexican and Guatemalan personnel and developing SIT field technology. At the same time, contractual agreements were made with Mexico under the Agency's technical assistance programme to furnish medfly SIT research and development expertise and equipment during the planning and early operational phases of the eradication programme.

### Plans for 1981–82

F.4.1/3. An FAO/IAEA regional seminar on control and/or eradication of the medfly by the use of SIT as the basis for an integral pest management programme in Latin America is due to be held in 1982 (Annex II (9)).

F.4.1/4. Agency research and development work on the practical application of medfly mass rearing, sterilization and release will continue as a back-up to the expertise being developed at the Mexican facility in Tapachula. This facility is expected to be operating at full capacity by late 1981, when it will be producing 500–600 million medfly pupae per week and will be able to conduct most of the research and development necessary to maintain its own programme. It is understood that laboratory expertise gained in the Mexican programme will be made available to other Member States engaged in campaigns against the medfly, and the Agency's laboratory back-up work on the medfly would therefore be phased out.

Outline of changes during 1983–86

F.4.1/5. The Agency will support research on genetic sexing mechanisms, population modelling and the economic assessment of SIT.

Related activities

F.4.1/6. The Agency's Laboratory will continue to carry out back-up research and provide training in support of this component until the end of 1981.

Co-operation with other organizations

F.4.1/7. This programme component involves co-operation with UNDP, EPPO, IOBC, USDA and the Dirección General de Sanidad Vegetal of the Mexican Secretaría de Agricultura y Ganadería.

Development of the sterile-insect technique against the tsetse fly and other biting flies (component F.4.2)

Objective

F.4.2/1. The objectives are to develop practices for the field application of the sterile-insect technique in eradicating or controlling the tsetse fly (1970–85) and to develop mass rearing and sterilization procedures for other blood-sucking dipterous insects (1980–85).

Results to date

F.4.2/2. Considerable progress has been made in the Laboratory in colonizing four tsetse fly species using both animal (in vivo) and membrane (in vitro) methods of feeding. Labour requirements have been reduced and, with the development of freeze-dried blood, the need for a constant source of fresh blood has been virtually eliminated.

Plans for 1981–82

F.4.2/3. The emphasis in tsetse fly research will be primarily on the needs of the Nigerian field project (BICOT). Refinements will be made in mass rearing techniques, freeze-drying of blood, development of quality control procedures, methods of reducing or eliminating the vectorial capacity of released insects, release methods and field assessment techniques to determine SIT efficiency. The results will be transferred to the Nigerian BICOT facility. Studies on mass rearing and sterilization of other blood-sucking arthropods and on radioisotope tagging to assist in ecological studies of these pests will be initiated.

F.4.2/4. With the aid of consultants, a status review will be made of tsetse fly control and/or eradication by integrated pest management programmes involving SIT (Table F.12, No.6).

F.4.2/5. Assistance to Member States in the entomological area will be given with work on ticks and their control using isotopes and radiation (in collaboration with the "Animal production and health" sub-programme) to determine various ecological parameters such as dispersion, population dynamics and density.

Outline of changes during 1983–86

F.4.2/6. Tsetse fly research will continue to be devoted primarily to the implementation of the field project in Nigeria with emphasis on developing an economically feasible technique to support or assist existing methods of tsetse fly control. The use of SIT as a quarantine measure against reinvasion by tsetse fly will be investigated. The co-ordinated research programme on tsetse fly control or eradication by SIT will be extended to 1984 (Table F.11, No.6). If the demand warrants it, preliminary investigations on the rearing and sterilization of other blood-sucking arthropods will be expanded to cover release studies and ecological investigations in field pilot studies.

Related activities

F.4.2/7. The Agency's Laboratory will carry out research and continue to provide training in support of the activities comprising this programme component.

Co-operation with other organizations

F.4.2/8. This component includes co-operation with WHO, UNEP, US-AID, GSF, ILRAD, ICIPE and other organizations.

## Use of isotopes and radiation in developing insect pest management (component F.4.3)

Objective

F.4.3/1. The objective is to solve specific important pest management problems such as those associated with the optimization of insecticide application timing and methods, target insect ecology, genetic control, host succession and migration (1978–83); to determine host feeding mechanisms (in collaboration with the "Plant breeding and genetics" sub-programme) (1979–84); and to determine the pathogen-vector relationships in animal and plant diseases (1980–85).

Plans for 1981–82

F.4.3/2. A co-ordinated research programme on the use of isotopes in the development of pest management systems (with emphasis on rice insects) will be carried out (Table F.11, No.5).

F.4.3/3. Assistance to Member States in the entomological area will be given through co-ordinated research programmes in connection with work on disease resistance in crop plants under the "Plant breeding and genetics" sub-programme, the aim being to devise plant-screening techniques.

Related activities

F.4.3/4. The Agency's Laboratory will carry out research on insect dispersal, population dynamics and predator-prey relationships and provide training in support of this component.

Outline of changes during 1983–86

F.4.3/5. Field demonstrations of integrated pest management will be carried out by national organizations on the basis of the results obtained through the co-ordinated research programme. Interactions between plant and animal disease vectors and their hosts will be investigated by means of isotope techniques.

Co-operation with other organizations

F.4.3/6. This component involves co-operation with UNDP and IOBC.

## SUB-PROGRAMME F.5

### Chemical residues and pollution

### OBJECTIVE

F.5/1. The objective is to assist and advise Member States of the Agency and FAO on the safe and effective use of isotope and irradiation techniques for the study and control of residue and pollution problems in agriculture, forestry, fisheries and food.

### OUTLINE FOR 1981–86

F.5/2. Co-ordinated research programmes involving the development and application of isotope techniques for studying residue, pollution and resource conservation problems in agriculture, forestry and fisheries will continue until 1982–83.

F.5/3. Work under future research programmes will concentrate on the better use of agricultural residues, "bound" pesticide residues, the use of herbicides and related chemicals in soil nitrogen management and the better exploitation of isotope technique for quantifying disturbances in large ecosystems caused by agriculture, deforestation and so on.

F.5/4. Summaries of comparative data and information on the inputs, levels, fate and effects of trace contaminants (including radioactive substances) in agriculture, fisheries and food will continue to be compiled and published as an aid to scientists in developing Member States.

F.5/5. Support will be provided for technical assistance activities, and further international training courses are planned. A laboratory manual on nuclear techniques for studying chemical residue and pollution problems will be published in 1981.

### STRUCTURE

F.5/6. This sub-programme (with which about six technical assistance projects are associated at present) consists of three components, which are described in the following paragraphs.

Chemical residues and pollution

Summary by programme components

Table F.9

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Isotope-aided research on agricultural nitrogen residues, with particular reference to their conservation as fertilizers and their behaviour as potential pollutants | 0.4 (1.2)[a] | 1.0 (0,1) | 47 200 | – | 35 000 | 1 800 | 84 000 |
| Isotope-tracer-aided studies of residue-biota interactions in agriculture and fisheries | 0.4 (0.7) | 1.0 (0.1) | 47 300 | – | 30 000 | 1 700 | 79 000 |
| Collection and dissemination of comparative data on inputs, levels, the fate and effects of contaminants (including radioactive substances) in agriculture, fisheries and food | 0.4 (0.2) | 0.2 (–) | 29 700 | – | – | 300 | 30 000 |
| Linguistic services | – | – | – | – | – | 26 000 | 26 000 |
| Printing and publishing services | – | – | – | – | – | 43 000 | 43 000 |
| TOTAL | 1.2 (2.1) | 2.2 (0.2) | 124 200 | – | 65 000 | 72 800 | 262 000 |

[a] FAO staff in brackets.

Isotope-aided research on agricultural nitrogen residues, with particular reference to their conservation as fertilizers and their behaviour as potential pollutants (component F.5.1)

Objective

F.5.1/1. The objective is to develop agrochemical and soil management practices which minimize the pollutant potential of agricultural nitrogen residues and better conserve them as a useful fertilizer (1975–83) (in collaboration with the "Soil fertility, irrigation and crop production" sub-programme).

Results to date

F.5.1/2. Many of the important agricultural and environmental factors which control the conservation and loss of soil nitrogen have been identified in the current co-ordinated research programme (Table F.11, No.7). A review and report on the programme as a whole has been prepared for publication in the IAEA Panel Proceedings Series in 1980. On the basis of the results obtained, the Federal Republic of Germany, through GSF, has extended support for the programme for a further three years until 1982.

Plans for 1981–82

F.5.1/3. On the basis of the information and data collected during the first quinquennium of the co-ordinated research programme, a series of recommendations will be developed in the form of a report for use by Member States. Further experiments to be carried out at selected institutes in Member States and additional international data acquisition activities (with the support of the Federal Republic of Germany) will be taken into account.

Related activities

F.5.1/4. Related support to developing Member States will continue to be provided through technical assistance, training and the dissemination of information. The Agency's Laboratory will continue to support research, provide training and assist contractors with analyses.

Outline of changes during 1983–86

F.5.1/5. The co-ordinated research programme will be terminated in 1983 with a final report and recommendations. It is then planned to initiate a new programme on isotopic tracer and environmental isotopic ratio studies of critical changes in the agricultural environment caused by land clearance for food and/or botanical fuel production.

Co-operation with other organizations

F.5.1/6. Co-operation and liaison will continue with the GSF and with relevant international programmes as required, e.g. the SCOPE/UNEP programme on nitrogen cycles in different ecosystems.

Isotope-tracer-aided studies of residue-biota interactions in agriculture and fisheries (component F.5.2)

Objective

F.5.2/1. The objective is to develop isotope techniques as a monitoring tool for use in determining soil and water quality and their respective capacities for degrading undesirable chemical residues and pollutants (1977–82); to study the role of herbicides and related chemicals in soil and fertilizer nitrogen management (in collaboration with the "Soil fertility, irrigation and crop production" sub-programme) (1980–85); to improve the recycling of agricultural waste and low-value by-products (1980–83); to develop and apply a common methodology to studies of atmospheric sulphur pollutant-plant interactions (1978–83); and to study the problems of "bound" (i.e. unextractable) pesticide residues in soils, plants and edible products (1980–85).

Results to date

F.5.2/2. The results of the first five years of the co-ordinated research programmes on the development and application of labelled substrate techniques for studying agrochemical residue-biota interactions in soil and aquatic ecosystems have been prepared for publication (Table F.11, Nos.10–12). Useful data have also been obtained on the responses of sensitive crops to atmospheric sulphur dioxide and a better understanding has been gained of the biochemical mechanisms involved (Table F.11, No.13).

Plans for 1981–82

F.5.2/3. Isotope-aided studies of chemical residue problems in developing Member States will be continued through co-ordinated research programmes with financial support by SIDA (Table F.11, Nos.10 -12). An FAO/IAEA symposium in 1982 will review the impact of isotope and radiation techniques in comparative studies of food and environmental contamination (Annex II (10)). The status of research on bound pesticide residues in soils, plants and food will be reviewed with consultant assistance (Table F.12, No.7).

Related activities

F.5.2/4. Support for developing Member States will be provided through technical assistance and training activities.

Outline of changes during 1983–86

F.5.2/5. Recommendations on techniques for monitoring the pollutant content of soil and water, especially in large ecosystems exposed to major changes in agricultural practice (such as changes involving deforestation), will be published. The use of techniques for detecting important changes in the quality of soil and water as a result of factors such as large-scale changes in drainage area management practices, deforestation and air-borne pollution will be emphasized through co-ordinated research programmes and technical assistance.

Co-operation with other organizations

F.5.2/6. Besides close liaison with SIDA, co-operation will be maintained with a number of United Nations organizations (such as UNESCO, under its "Man and the Biosphere" programme, WHO, UNEP and UNSCEAR) and with intergovernmental bodies (for example, the International Academy of Environmental Safety and ESNA).

Collection and dissemination of comparative data on inputs, levels, the fate and effects of contaminants (including radioactive substances) in agriculture, fisheries and food (component F.5.3)

Objective

F.5.3/1. The objective is to compile, evaluate, compare and summarize, in a concise and standardized format, data on foreign chemicals (including radioactive substances) which appear in food, the environment and the tissues of organisms (1973-continuing).

Results to date

F.5.3/2. A number of summaries dealing with individual substances such as particular pesticides and radionuclides and with groups of substances such as all herbicides and all fertilizers have been compiled and published by an international journal (Chemosphere) on a cost-free basis in accordance with a standardized format that has been developed.

Plans for 1981–82

F.5.3/3. Further summaries will be prepared and published, and a collection of all summaries (including a glossary of important terms and definitions) is planned for 1981–82 as an aid to environmental scientists in developing Member States.

Related activities

F.5.3/4. Liaison and information exchange will be maintained with national and international environmental information centres (for example, those co-ordinated by UNEP and the United States Environmental Protection Agency).

## SUB-PROGRAMME F.6

### Food preservation

OBJECTIVE

F.6/1. The objective is to assist and advise Member States of the Agency and FAO in connection with facilitating the practical application of food irradiation where it produces a wholesome product and offers clear economic, technological or environmental advantages and, in the light of the fact that these requirements appear to have been met for a number of foods, to achieve, in collaboration with WHO and FAO, general acceptance of the food irradiation process.

OUTLINE FOR 1981–86

F.6/2. Emphasis will shift from the methodological aspects of food irradiation towards the technological and economic feasibility of the food irradiation process with a view to further pilot- or commercial-scale applications. Therefore, increased attention will be given to the training of scientists and technicians in the technology, economics, legislation and commercialization of food irradiation.

F.6/3. There will also be a shift of emphasis from wholesomeness clearance of individual food items to the problem of obtaining clearance of the food irradiation process itself and its acceptance by the consumer.

F.6/4. Hence, programmes will be developed to facilitate the commercialization of food irradiation processes and the acceptance of these processes by public health and legislative authorities and consumers. Progress in the commercialization of food irradiation technology, however, ultimately depends on actions to be taken by Member States.

F.6/5. Training will be provided at the International Facility for Food Irradiation Technology (IFFIT) at Wageningen, the Netherlands, in co-operation with participating institutions of Member States of FAO or the Agency, and also by means of inter-regional training courses on food irradiation technology.

F.6/6. The training of scientists from developing Member States party to RCA in large-scale research and development work on food irradiation for practical applications will also be emphasized. Negotiations on the use of the food irradiation development facility in Japan for this type of regional training are now taking place.

F.6/7 The RCA programme on the radiation preservation of food items of interest to RCA parties (dried fish, potatoes, onions, grain and spices) will be continued (Table F.11, No.26).

F.6/8. The recommendation for international clearance of the food irradiation process is likely to reach a decisive stage at the time of the meeting of the Joint FAO/IAEA/WHO Expert Committee on the Wholesomeness of Irradiated Food in late 1980. This recommendation has then to be submitted to the Codex Alimentarius Commission for adoption and possible acceptance by its Member States in accordance with Codex procedures. Since delays in the commercialization of irradiated foodstuffs result mainly from the attitude of the public, a sphere where the Agency cannot make a great contribution, the scope and orientation of this sub-programme would be reviewed at this stage. Such a review would be timed to take into account the termination of the agreements concerning IFFIT (1983) and IFIP (International Project in the Field of Food Irradiation) (1981).

STRUCTURE

F.6/9. This sub-programme consists of two components, which are described in the following paragraphs.

## Food preservation

### Summary by programme components

Table F.10

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Technological and economic feasibility of food irradiation | 3.4 (0.1)[a] | 0.2 (1.1) | 268 600 | 21 000 | 55 000 | 3 400 | 348 000 |
| Public health acceptance and regulatory aspects of the process of food irradiation | 1.7 (0.1) | 0.2 (1.0) | 130 900 | – | 25 000 | 2 100 | 158 000 |
| Linguistic services | – | – | – | – | – | 26 000 | 26 000 |
| Printing and publishing services | – | – | – | – | – | 43 000 | 43 000 |
| Conference services | – | – | – | – | – | 10 000 | 10 000 |
| TOTAL | 5.1 (0.2) | 0.4 (2.1) | 399 500 | 21 000 | 80 000 | 84 500 | 585 000 |

[a] FAO staff in brackets.

### Technological and economic feasibility of food irradiation (component F.6.1)

#### Objective

F.6.1/1. The objective is to collaborate in the implementation of projects for extending the shelf-life of important items and in the pilot-scale irradiation of certain food products through the rigorous comparative examination of technological feasibility, economics and energy requirements (1974-continuing); to collaborate in the activities of the International Facility for Food Irradiation Technology (IFFIT) at Wageningen, the Netherlands, (1979–83); and to co-ordinate the development of the radiation preservation of Asian fish and fishery products (1975–83).

#### Results to date

F.6.1/2. The co-ordinated research programme on the technological and economic feasibility of food irradiation (Table F.11, No.24) has concentrated on the following activities:

(i) Pilot-scale (semi-industrial) and commercial-scale projects for sprout inhibition in potatoes, onions and garlic and the delaying of ripening in subtropical fruits.
(ii) Small-scale projects for establishing the technological feasibility of irradiation for storage life extension, with special reference to: insect disinfestation in cocoa-beans, rice, dates and mangoes; mould control in cocoa-beans, mangoes, papayas and litchees; sprout inhibition in potatoes, onions and yams; observation of the effect of sprout inhibition doses on fungi and bacteria in potatoes, onions, garlic and yams.
(iii) Research on radiation effects in certain vegetables (potatoes and tomatoes).

F.6.1/3. The co-ordinated research programme on radiation preservation of Asian fish and fishery products has made considerable progress with regard to identifying doses for the effective insect disinfestation of dried fish and the elimination of certain public health micro-organisms from raw and processed fish and fishery products under conditions prevailing in tropical countries. This programme was terminated in 1979–80.

F.6.1/4. The scope of the RCA co-ordinated research programme on the radiation preservation of dried fish indigenous to Asia will be expanded to cover other items of interest to the Asian region (for example, potatoes, onions, tropical fruits, grains and spices) under the title "Asian Regional Co-operative Project on Food Irradiation" (Table F.11, No. 26).

F.6.1/5. These co-ordinated research programmes have contributed directly and indirectly to the involvement of national authorities in essential small-scale, semi-industrial or commercial projects. They have also effectively supported and complemented IFIP by providing – on products such as cocoa-beans, dates and mangoes – technological data necessary for the wholesomeness studies.

Plans for 1981–82

F.6.1/6. Pilot-scale feasibility studies (mainly on root crops, grains, fruits, vegetables and fishery products) will be conducted through IFFIT, which was established in 1978 by agreement between FAO, IAEA and the Ministry of Agriculture and Fisheries of the Netherlands. The duration of the project is five years. IFFIT will also be used for training scientists from developing countries in the technology and economics of food irradiation and in the commercialization of irradiated food items.

F.6.1/7. The co-ordinated research programme on the technological and economic feasibility of food irradiation is being terminated during 1980 and a Technical Report will be issued in 1981 (Table F.11, No.24). A programme will then be initiated to assess the technological and economic feasibility of pilot- or commercial-scale applications of irradiation, mainly of root crops, grains, fruits, vegetables and fishery products. The programme will also include new areas that have been shown to be commercially encouraging, such as disinfestation of maize and beans, shelf-life extension of strawberries and mushrooms, eradication of salmonella and other pathogens in spices, poultry and lifestock, and control of Aftosa. Guidelines for the comparative evaluation of the energy requirements and of the economics of radiation processing versus traditional preservation techniques will be established.

F.6.1/8. Work will continue under the RCA co-ordinated research programme entitled "Asian Regional Co-operative Project on Food Irradiation" (Table F.11, No.26).

F.6.1/9. Consultants on the marketing and market testing of foods will review the experience gained with irradiated foods and will develop strategies for market testing with special reference to the needs of the developing countries (Table F.12, No.8).

F.6.1/10. In this respect, a regional FAO/IAEA seminar on the approval of the food irradiation process by public health and food legislation authorities of Member States in Asia will be held in 1981 (Annex I (9)). Special missions will be undertaken to Member States on request to advise on the organization and management of the irradiation of human foods and animal feedstuffs.

Related activities

F.6.1/11. Technical assistance will be provided to Member States as requested. International training courses will be held on food irradiation technology.

Outline of changes during 1983–86

F.6.1/12. A co-ordinated research programme will be developed on the technology and economic feasibility of the irradiation of animal feed including feed from household remnants and other agricultural wastes.

Co-operation with other organizations

F.6.1/13. This programme component involves co-operation with UNEP, CEC and CMEA. Co-operation regarding both scientific and public acceptance questions with international scientific bodies such as ESNA, the International Union of Food Science and Technology and IUPAC is also envisaged.

## Public health acceptance and regulatory aspects of the process of food irradiation (component F.6.2)

### Objective

F.6.2/1. The objective is to assist in achieving general acceptance of the food irradiation process as a means of reducing world food losses through participation in the Codex Alimentarius in collaboration with WHO and FAO (1974-continuing) and collaboration in the activities of the International Project in the Field of Food Irradiation (IFIP), Karlsruhe, Federal Republic of Germany (1971–82); and to assist in the implementation of legal regulations regarding irradiated food and advise on their application (in collaboration with the Legal Division) (1979-continuing).

### Results to date

F.6.2/2. Wholesomeness studies (viz. long- and short-term feeding tests, short-term in vitro and in vivo investigations as a screen for adverse biological activity in irradiated foods and acquisition of specific irradiation chemistry data) carried out at national laboratories and also as part of IFIP's activities, have demonstrated the safety of various irradiated foods for human consumption. So far, 28 food items have been given unlimited or limited public health clearance in 20 countries. An International Standard for Irradiated Foods and a Code of Practice for the Operation of Radiation Facilities used for the Treatment of Foods have been recommended by the Codex Alimentarius Commission (December, 1979).

### Plans for 1981–82

F.6.2/3. Participation in IFIP will continue under the second extension of the project agreement up to the end of 1981. Wholesomeness tests to pursue clearance of food irradiated in the high-dose range are expected to be performed at Karlsruhe (IFIP). In 1980, a joint FAO/IAEA/WHO expert committee will review wholesomeness data with a view to recommending international acceptance of the irradiation of broad groups of foods of similar chemical composition and/or of all foods irradiated below a certain dose level (for example 1 Mrad), or even the food irradiation process as such. In this connection, studies of the radiolysis of food components and complex foods will be intensified at Karlsruhe, as will efforts to disseminate information on the wholesomeness of irradiated foods in Member States.

F.6.2/4. Assistance will be given to legislative authorities in developing Member States in their implementation of the regulations for the control of, and trade in, irradiated food in Asia (Annex I (9)).

F.6.2/5. The co-ordinated research programme on the wholesomeness of the process of food irradiation (Table F.11, No. 25) is being terminated during 1980; a new programme will be initiated on factors influencing the utilization of the food irradiation process with emphasis on national requirements in Member States (Table F.11, No.28).

F.6.2/6. Work concerning the regulatory aspects of food irradiation will be carried out in co-operation with the Agency's Legal Division.

F.6.2/7. Collaboration with WHO, with the Codex Alimentarius Commission of the FAO/WHO Food Standards Programme and with appropriate bodies within CEC and CMEA is planned, the aim being to further international agreement on the wholesomeness of irradiated foods and the general acceptability of the food irradiation process.

### Related activities

F.6.2/8. Support services will be provided for technical assistance projects.

### Outline of changes during 1983–86

F.6.2/9. Activities will centre on achieving global acceptance of the food irradiation process.

### Co-operation with other organizations

F.6.2/10. Co-operation with WHO, the Codex Alimentarius Commission and NEA is an important part of this programme component.

## Co-ordinated research programmes

Table F.11

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Nuclear techniques in development of fertilizer and water management practices for multiple cropping systems | This programme has been approved but no contract has yet been awarded | | | |
| 2. Radioactive tracer studies of bound residues in soils, plants and their edible products | This programme has been approved but no contract has yet been awarded | | | |
| 3. Isotope techniques in studies of biological nitrogen fixation for the dual purpose of increasing crop production and decreasing nitrogen fertilizer use to conserve the environment | 13 | 8 | 1977 | 1982 |
| 4. Isotope and radiation techniques for efficient water and fertilizer use in semi-arid regions | 10 | 3 | 1977/78 | 1983 |
| 5. Use of isotopes in pest management with emphasis on rice insects | 4 | 2 | 1977 | 1983 |
| 6. Tsetse fly control or eradication by the sterile-male technique | 7 | 6 | 1970 | 1984 |
| 7. Agricultural nitrogen residues with particular reference to their conservation as fertilizers and behaviour as potential pollutants | 14 | 7 | 1973 | 1982 |
| 8. Isotopic tracer-aided studies of the role of herbicides and related chemicals in soil and fertilizer nitrogen management | This programme has been approved but no contract has yet been awarded | | | |
| 9. Development and application of nuclear techniques for improved utilization of agricultural residues | This programme has been approved but no contract has yet been awarded | | | |
| 10. Isotopic-tracer-aided studies of chemical residues in cotton seed, feed, oil and related products | 9 | 1 | 1974 | 1980 |
| 11. Isotopic-tracer-aided research and monitoring programme on agricultural residue-biological interactions in aquatic ecosystems | 6 | 3 | 1976 | 1981 |
| 12. Isotopic-tracer-aided studies of agrochemical residue-soil biota interactions | 6 | 3 | 1977 | 1982 |
| 13. Isotopic-tracer-aided studies of atmospheric sulphur pollutant-plant interactions | 4 | 3 | 1977 | 1980 |
| 14. Use of nuclear techniques for seed protein improvement | 9 | 6 | 1971 | 1982 |
| 15. Use of induced mutations for disease resistance in crop plants | 7 | 11 | 1970 | 1980 |
| 16. Improvement of vegetatively propagated crops and tree crops through radiation-induced mutations | 8 | 8 | 1972 | 1981 |
| 17. Use of radiation-induced and chemically induced mutations to provide an improved germ plasma base for grain legume production in South East Asia | 12 | 1 | 1976 | 1981 |

| Co-ordinated programme title | Number | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 18. Radiation-induced semi-dwarf rice mutant stocks | This programme has been approved but no contract has yet been awarded | | | |
| 19. Induced mutations for disease resistance in grain legumes | 10 | 3 | 1977 | 1982 |
| 20. Use of nuclear techniques to improve domestic buffalo production in Asia | 11 | 4 | 1974 | 1982 |
| 21. Use of radioimmunoassay and related techniques to improve the reproductive performance of domestic animals | 12 | 5 | 1976 | 1981 |
| 22. Use of isotopes to detect moderate mineral imbalances in farm animals | 10 | 6 | 1976 | 1981 |
| 23. Use of isotope techniques in research and control of ticks and tick-borne diseases | 3 | 5 | 1977 | 1981 |
| 24. Technological and economic feasibility of food irradiation | 8 | 8 | 1974 | 1980 |
| 25. Wholesomeness of the process of food irradiation | 6 | 2 | 1974 | 1980 |
| 26. Asian regional co-operative project on food irradiation | 6 | – | 1978 | 1983 |
| 27. Pre-commercial scale radiation treatment of food | This programme has been approved but no contract has yet been awarded | | | |
| 28. Factors influencing the utilization of the food irradiation process | This programme has been approved but no contract has yet been awarded | | | |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)
Table F.12

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | IAEA-TECDOC containing guidelines for research programme on fertilizer and water management practices for specific tree crops | FAO and Agency Secretariats, contractors and agreement holders | Consultants' meeting in 1981 | 1982 | F.1.1/7 |
| 2 | IAEA-TECDOC on the feasibility of inducing plant mutations in extra-nuclear hereditary elements | FAO and Agency Secretariats and plant breeding institutions in Member States | Consultants' meeting in 1981 | 1982 | F.2.4/3 |
| 3 | IAEA-TECDOC containing guidelines for research programme on induced mutation technology for practical crop improvement | As above | Consultants' meeting in 1982 | 1983 | F.2.4/4 |
| 4 | IAEA-TECDOC on the role of isotopes in identifying productive animal breeds and strains for dry and wet tropical areas | FAO and Agency Secretariats, donor agencies and research institutions | Consultants' meeting in 1981 | 1982 | F.3.1/5 |
| 5 | IAEA-TECDOC on recent developments in isolating sexes in mass-reared insects | FAO and Agency Secretariats and research institutions concerned with the application of SIT | Consultants' meeting in 1981 | 1982 | F.4/6 |
| 6 | IAEA-TECDOC on tsetse fly mass rearing, sterilization and release as used in SIT in integrated pest management systems | As above | Consultants' meeting in 1982 | 1983 | F.4.2/4 |
| 7 | IAEA-TECDOC on studies of bound pesticide residues in soils, plants and food | FAO and Agency Secretariats and laboratories concerned with pesticide residues in food | Consultants' meeting in 1982 | 1983 | F.5.2/3 |
| 8 | IAEA-TECDOC on marketing and market testing of irradiated foods with recommended strategies for developing Member States | FAO and Agency Secretariats and food processing and marketing organizations | Consultants' meeting in 1982 | 1983 | F.6.1/9 |

# G. LIFE SCIENCES

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table G.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 739 460 | 889 000 | 62 000 | (80 000) | (18 000) | 871 000 | 936 000 | 979 000 |
| Consultants | 16 111 | 39 500 | 1 700 | (10 500) | (8 800) | 30 700 | 32 000 | 31 000 |
| Overtime | 606 | – | – | – | – | – | – | – |
| Temporary assistance | 8 637 | 2 500 | 100 | (1 600) | (1 500) | 1 000 | 1 000 | 1 000 |
| Sub-total | 764 814 | 931 000 | 63 800 | (92 100) | (28 300) | 902 700 | 969 000 | 1 011 000 |
| Common staff costs | 225 721 | 258 100 | 32 500 | (25 000) | 7 500 | 265 600 | 290 000 | 303 500 |
| Travel | 21 068 | 31 800 | 4 700 | (2 700) | 2 000 | 33 800 | 37 000 | 39 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 27 850 | 99 000 | 15 000 | – | 15 000 | 114 000 | 46 000 | 139 000 |
| Technical committees, advisory groups | 66 580 | 25 000 | 4 000 | 31 000 | 35 000 | 60 000 | 51 000 | 69 000 |
| Representation and hospitality | 2 538 | 4 700 | 200 | – | 200 | 4 900 | 6 000 | 7 000 |
| Scientific and technical contracts | 453 097 | 516 000 | 38 000 | (23 000) | 15 000 | 531 000 | 607 000 | 633 000 |
| Scientific supplies and equipment | 751 | 6 400 | 200 | (2 600) | (2 400) | 4 000 | 4 500 | 2 000 |
| Common services, supplies and equipment | 1 183 | 10 000 | 300 | (5 300) | (5 000) | 5 000 | 5 500 | 5 500 |
| Other items of expenditure | – | 1 000 | 100 | (100) | – | 1 000 | – | – |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 49 573 | 79 000 | 4 000 | (46 000) | (42 000) | 37 000 | 45 000 | 59 000 |
| Printing and publishing services | 178 442 | 280 000 | 30 000 | (47 000) | (17 000) | 263 000 | 226 000 | 240 000 |
| Data processing services | 2 497 | 3 000 | – | (1 000) | (1 000) | 2 000 | 2 000 | 2 000 |
| Laboratory services | 707 668 | 675 000 | 52 000 | (50 000) | 2 000 | 677 000 | 730 000 | 770 000 |
| Conference services | – | 52 000 | 4 000 | 2 000 | 6 000 | 58 000 | 34 000 | 45 000 |
| TOTAL | 2 501 782 | 2 972 000 | 248 800 | (261 800) | (13 000) | 2 959 000 | 3 053 000 | 3 325 000 |

## SUMMARY OF MANPOWER

Table G.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 5 | 5 | 5 | – | 5 | 5 | 5 |
| P-4 | 6 | 6 | 5 | – | 5 | 5 | 5 |
| P-3 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-2 | 1 | 1 | – | – | – | – | – |
| Sub-total | 14 | 14 | 12 | – | 12 | 12 | 12 |
| GS | 10 | 10 | 10 | – | 10 | 10 | 10 |
| TOTAL | 24 | 24 | 22 | – | 22 | 22 | 22 |

## CHANGES IN COSTS AND MANPOWER

### Costs

G/1. As will be seen from Table G.1 above, it is expected that the cost of this programme will decrease by $13 000 as a net result of salary and other price increases of $248 800 and a programme decrease of $261 800.

G/2. The programme decrease of $105 000 in respect of salaries and common staff costs reflects the abolishing of two Professional posts, a P-4 post in the "Dosimetry" sub-programme and a P-2 post in the "Health-related environmental research" sub-programme. These posts are transferred to other programmes in the adjusted manning table for 1980 following the annual survey on manpower utilization. Programme decreases are also foreseen in respect of consultants' services ($10 500), temporary assistance ($1 600) and duty travel ($2 700).

G/3. The programme increase of $31 000 in respect of technical committees and advisory groups reflects the intention to hold a larger number of advisory group meetings in 1981 than in 1980. It is offset by programme reductions in respect of scientific and technical contracts ($23 000), related mainly to the "Radiation biology" sub-programme, scientific supplies and equipment ($2 600) and common services, supplies and equipment ($5 300).

G/4. As regards the allocation of service costs, programme reductions are foreseen in respect of linguistic services ($46 000), printing and publishing services ($47 000), data processing services ($1 000) and laboratory services ($50 000). The programme increase of $2 000 in respect of conference services is related to the increase in the number of advisory group meetings.

### Manpower

G/5. As will be seen from Table G.2 above, the manning table for this programme is reduced by two Professional posts. One P-4 post in the "Dosimetry" sub-programme and one P-2 post in the "Health-related environmental research" sub-programme are transferred to other programmes in the adjusted manning table for 1980.

G/6. No further changes in manpower are foreseen for 1981, 1982 and 1983.

## Summary of manpower and costs by sub-programme

Table G.3

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | Man-years | | Costs | Man-years | | Costs |
| | P | GS | | P | GS | | P | GS | |
| Medical applications | 3.2 | 2.2 | 1 140 000 | 3.2 | 2.2 | 1 256 000 | 3.2 | 2.2 | 1 414 000 |
| Dosimetry for intentional radiation exposures | 3.3 | 4.3 | 858 000 | 3.3 | 4.3 | 905 000 | 3.3 | 4.3 | 937 000 |
| Radiation biology | 3.3 | 2.3 | 686 000 | 3.3 | 2.3 | 568 000 | 3.3 | 2.3 | 636 000 |
| Health-related environmental research | 2.2 | 1.2 | 275 000 | 2.2 | 1.2 | 324 000 | 2.2 | 1.2 | 338 000 |
| TOTAL | 12.0 | 10.0 | 2 959 000 | 12.0 | 10.0 | 3 053 000 | 12.0 | 10.0 | 3 325 000 |

## THE PROGRAMME

### OBJECTIVE

G/7. The objective is to foster – in close collaboration with other organizations belonging to the United Nations family, especially WHO, to whom it is the Agency's policy to hand over at the appropriate time those activities in the programme which relate to procedures whose applications have become routine – the development of techniques for the application of radiation and radionuclides in medicine, biology and health-related environmental research and to promote the use of techniques for improving accuracy in radiation dosimetry.

### STRUCTURE

G/8. This programme consists of four sub-programmes, which are dealt with separately below.

*(see Table G.3)*

## SUB-PROGRAMME G.1

### Medical applications

### OBJECTIVE

G.1/1. The objective is to provide advice and assistance to Member States, particularly developing countries, in acquiring and improving techniques appropriate to the use of radionuclides in preventive and clinical medicine and in medical research and, in collaboration with WHO, to promote their use in applications of local importance.

### OUTLINE FOR 1981–86

G.1/2. Continued emphasis will be given to the development and testing of techniques for the use of radioactive preparations and nuclear instruments in medical research and clinical medicine. The existing programme components will be retained, but with shifts in the activities under each as indicated below. As a general trend, reduced emphasis will be placed on investigations dealing with particular disease conditions and increased emphasis will be placed on the quality control of techniques.

### STRUCTURE

G.1/3. This sub-programme consists of four components, which are described in the following paragraphs.

## Medical applications

### Summary by programme components

Table G.4

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Instrumentation for nuclear medicine in developing countries | 0.7 | 0.6 | 70 800 | – | 60 000 | 7 200 | 138 000 |
| Technical improvement of in vitro assay procedures with radioactive agents | 1.0 | 0.6 | 95 400 | – | 70 000 | 2 600 | 168 000 |
| Technical improvement of in vivo procedures with isotopic agents | 1.0 | 0.5 | 90 800 | 21 000 | 47 000 | 3 200 | 162 000 |
| Activation analysis of elements of biomedical significance | 0.5 | 0.5 | 54 100 | 11 000 | 50 000 | 3 900 | 119 000 |
| Linguistic services | – | – | – | – | – | 20 000 | 20 000 |
| Printing and publishing services | – | – | – | – | – | 81 000 | 81 000 |
| Data processing services | – | – | – | – | – | 1 000 | 1 000 |
| Laboratory services | – | – | – | – | – | 440 000 | 440 000 |
| Conference services | – | – | – | – | – | 11 000 | 11 000 |
| TOTAL | 3.2 | 2.2 | 311 100 | 32 000 | 227 000 | 569 900 | 1 140 000 |

### Instrumentation for nuclear medicine in developing countries (component G.1.1.)

#### Objective

G.1.1/1. The objective is to stimulate more effective selection and use of nuclear medicine instruments in developing countries, in particular by: (a) encouraging comparisons of the value of alternative nuclear medicine procedures and associated instruments, using the methodology of cost-effectiveness analysis (1979–81); (b) formulating recommendations on and arranging for the construction of prototype instruments for the application of such procedures (1976–81); (c) encouraging the development and exchange of software for the application of such procedures (1980–85); and (d) assisting in the implementation of improved strategies for maintaining instruments (1980–86).

#### Results to date

G.1.1/2. This component has received encouragement and supplementary financial support from the Government of the United States of America since 1975.

G.1.1/3. Under a research contract established in 1976, several prototype cost-effectiveness analyses were performed to test the usefulness of this methodology in appraising alternative medical applications of radionuclides in developing countries and determining the instrumentation requirements.

G.1.1/4. Prototype automatic well scintillation counters of novel design, appropriate to the conditions found in developing countries, have been constructed in the Agency's Laboratory (see "The Laboratory" programme) and tested under research contracts. A commercial version of the counter is now on the market. Surveys and analyses have been conducted with the aid of consultants, and reports have been prepared on the commonly offered and desirable characteristics of other nuclear medicine instruments and devices, including well scintillation counters, liquid scintillation counters, probe counters, scanners, gamma cameras, whole-body counters and devices for conditioning electrical mains power.

G.1.1/5. Surveys have been conducted under a co-ordinated research programmes on the state of maintenance of nuclear medicine instruments in about 200 laboratories in 25 countries in South East Asia, Latin America and Africa (Table G.8, No.10). The results will be issued as technical documents in 1980. A programme under RCA is in progress in eight countries of South East Asia to upgrade maintenance on the basis of the survey findings; similar remedial programmes have been initiated in Latin America and Africa (Table G.8, No.1). A seminar on the maintenance of nuclear instruments is being held in South East Asia this year.

G.1.1/6. Staff members have participated in technical assistance activities related to this component, including the evaluation of instrument requests and the organization of training courses on nuclear electronics.

Plans for 1981–82

G.1.1/7. Further prototype cost-effectiveness analyses of alternative nuclear medicine procedures and associated instrumentation will be made mainly through research contracts, in fields judged amenable to this approach. These will, if possible, include competing in vitro assay procedures for diagnosis of thyroid disease and imaging procedures for the diagnosis of liver disease.

G.1.1/8. Design characteristics of selected instrument systems, especially well scintillation counters and gamma cameras, will be kept under study and recommendation will be made on features important to users in developing countries. Data on well scintillation counters will be compiled for the 1982 symposium on radioimmunoassay and related procedures in medicine (Annex II (11)).

G.1.1/9. As instruments come to incorporate calculators and microcomputers to a greater extent, their characteristics depend more on software than hardware, and software development and sharing can therefore assist users in developing countries to accomplish on simpler calculators problems that are normally solved on more elaborate data processing systems, as demonstrated by the Agency's prototype well-scintillation counter. It is expected that a first co-ordinated research programme will be established to improve and exploit software in in vitro assays, including software compatible with such counters. With the assistance of consultants, a guidance document will be prepared on the development of the relevant software and its application in developing countries (Table G.9, No.1).

G.1.1/10. Support will be continued through research contracts, the RCA programme, training courses and technical assistance activities for efforts to upgrade the maintenance of nuclear instruments (especially for medical applications) in South East Asia, Latin America and Africa.

Related activities

G.1.1/11. The entire "Nuclear medicine" sub-programme will benefit from progress made under this component, as will most technical assistance projects involving medical applications of nuclear instruments. The development, testing and intercomparison of instruments in the Agency's Laboratory will continue.

Outline of changes during 1983–86

G.1.1/12. Cost-effectiveness analysis of alternative nuclear medicine procedures will be phased out under this component, though specific applications may be investigated within the context of other components where relevant. The emphasis on activities related to instrument design will shift gradually from hardware to software.

Co-operation with other organizations

G.1.1/13. Close collaboration with WHO will be maintained, especially in the cost-effectiveness analysis of alternative nuclear medicine procedures and in the development of software for in vitro assays. Contact will continue with other United Nations organizations engaged in activities related to instrument maintenance.

## Technical improvement of in vitro assay procedures with radioactive agents (component G.1.2)

### Objective

G.1.2/1. The objective is to intercompare and to test the effectiveness of selected procedures for the in vitro assay of biologically active substances and, in collaboration with WHO, to promote their application to the solution of health problems of importance in developing countries, in particular by: (a) organizing an interlaboratory comparison of the reliability of procedures for the assay of thyroid hormones (1978–83); and (b) encouraging the development and increasing the availability of certain more "rugged" in vitro assay procedures and materials (1980–86).

### Results to date

G.1.2/2. Four co-ordinated research programmes have been completed on: general in vitro assay procedures; in vitro assay techniques in immunological studies of communicable diseases; in vitro assay techniques; and in-vitro assay procedures in studies of reproductive physiology. A fifth programme has been initiated on quality control of in vitro assay techniques for the measurement of thyroid-related hormones (Table G.8, No.9). Approximately 45 contracts were active at some time during the period 1975–1979.

G.1.2/3. In 1977, an Advisory Group formulated recommendations regarding the facilities needed for in vitro assay in developing countries; these were published in Atomic Energy Review in 1978. The following year, an Advisory Group made recommendations regarding the research contract programme under this component. The third in a series of symposia on radioimmunoassay and related procedures in medicine was held in 1977.

G.1.2/4. Prototype simple automatic sample counters for in vitro assay work have been tested in four laboratories, with results which have generally been very favourable.

G.1.2/5. In 1979 and 1980, the fourth and fifth training courses in a series on radioimmunoassay techniques were held. Support has been provided for the technical assistance programme; among projects involving experts and/or equipment from the Agency's own resources, an average of about five per year have been concerned largely with in vitro procedures.

### Plans for 1981–82

G.1.2/6. In association with a co-ordinated research programme, an interlaboratory comparison of reliability in the assay of thyroid-related hormones will be continued among about 60 laboratories (Table G.8, No.9). In a further development of this programme, attempts will be made to bring about improved performance through the use of more reliable reagents, better quality control procedures and the wider use of more advanced data analysis.

G.1.2/7. In response to recommendations by the 1978 Advisory Group, increased support will be given to the development, validation and dissemination of more "rugged" in vitro assay procedures (e.g. labelling, separation, purification) and materials (e.g. antibodies, antigens) as relevant to laboratories in developing countries. This will be achieved mainly through research contracts, technical contracts and the collection and dissemination of information by the Secretariat.

G.1.2/8. A symposium on radioimmunoassay and related procedures in medicine is planned for 1982 (Annex II(11)). Support will continue for the technical assistance programme, including, if possible, another regional training course on in vitro assay techniques.

### Related activities

G.1.2/9. Activities under the "Instrumentation for nuclear medicine in developing countries" component concerned with the analysis of competing procedures for diagnosing thyroid disease and with improved counting systems and software relate directly to this work.

Outline of changes during 1983–86

G.1.2/10. The co-ordinated research programme on the reliability of in vitro procedures for the assay of thyroid-related hormones will be completed (Table G.8, No.9). A similar programme is expected to be established in relation to another group of widely performed assays.

Co-operation with other organizations

G.1.2/11. Collaboration will be continued with WHO, especially on the quality control of in vitro assays.

## Technical improvement of in vivo procedures with isotopic agents (component G.1.3)

Objective

G.1.3/1. The objective is to intercompare and to test the effectiveness of selected in vivo procedures for clinical diagnosis and research and, in collaboration with WHO, to promote their application to the solution of health problems of importance in developing countries, in particular by: (a) propagating methods for the effective quality control of the instruments and methods used for measuring radionuclides in such procedures (1979–84); and (b) evaluating the suitability of stable isotopic tracer techniques for the study of selected health problems (1983–87).

Results to date

G.1.3/2. The fifth and sixth symposia in a series on medical radionuclide imaging took place in 1976 and 1980. A Technical Committee, held in 1977 in collaboration with the International Committee for Standardization in Haematology (ICSH), recommended several standardized radionuclide procedures in that field (reports published in the literature in 1979/80). An Advisory Group in 1979 made recommendations (issued in 1980) on quality assurance for instruments used in in vivo radionuclide procedures. A group of consultants in 1977 drafted recommendations on standardized radionuclide procedures for kidney function studies (published in 1980). In 1977 a Technical Committee meeting was organized jointly with CMEA on stable isotopes in the life sciences: their report was published in 1977.

G.1.3/3. Approximately 20 research contracts were active at some time during the period 1975–79.

G.1.3/4. Support was provided to the technical assistance programme. Of the projects in which experts and/or equipment are provided for medical applications of radionuclides, an average of about ten per year involve in vivo procedures. Assistance was provided to a three-month training course and study tour in the Soviet Union in 1979 on nuclear medicine; another such course is to be held in 1980. A study tour in Eastern Europe is also being arranged in 1980 on the use of stable isotopes in the life sciences.

Plans for 1981–82

G.1.3/5. A programme will be initiated to encourage adoption of sound quality control practices for instruments and procedures involved in in vivo medical radionuclide applications; this will be achieved mainly through technical assistance and the holding of seminars. A primary goal is to assist, in collaboration with WHO, in the organization of a series of projects in those countries of Latin America, South East Asia and Africa where major nuclear medicine capabilities exist. A seminar in 1981 to train local supervisors of these projects is proposed for Latin America (Annex I (10)). A status review and recommendations for further action in the light of experience gained will be prepared in 1982 (Table G.9, No.2).

Related activities

G.1.3/6. The activities under the "Instrumentation for nuclear medicine in developing countries" component will materially assist this activity. Continued support will be given to other technical assistance projects involving the in vivo use of radionuclides.

Outline of changes during 1983–86

G.1.3/7. It is expected that much of the support necessary for quality assurance of in vivo nuclear medicine can be provided by national programmes by the end of this period. Exploratory investigations will be initiated on the potential role of stable isotopes for in vivo diagnostic studies.

Co-operation with other organizations

G.1.3/8. Close co-operation will be maintained with WHO, especially in relation to the upgrading of quality assurance practices. Co-operation will be continued with ICSH in relation to haematological uses of radionuclides and with CMEA in regard to stable isotope techniques.

## Activation analysis of elements of biomedical significance (component G.1.4)

Objective

G.1.4/1. The objective is to intercompare and to assist in improving activation analysis techniques (especially those involving the use of research reactors) and other nuclear techniques for the assay of trace substances of biomedical significance and, in collaboration with WHO, to promote their application to the solution of health problems distinctively associated with local environments, in particular by: (a) conducting studies of trace elements in foods, especially human milk (1976–82); (b) studying the role of certain mineral elements in the epidemiology of ischaemic heart disease (1980–81); and (c) studying selected problems in occupational health (1980–83).

Results to date

G.1.4/2. A total of 22 research contracts and research agreements were active at some time during the period 1975–79. Interest has centred on two joint co-ordinated research programmes with WHO on the role of trace elements: in cardiovascular diseases (cvd) and in human nutrition (Table G.8, No.2). The first programme was concluded in 1979 and a final report prepared for publication in 1980. While the practical significance of the findings in relation to the prevention and/or treatment of cvd remains unclear, a number of associations between trace elements and cvd have nevertheless come to light. The second programme has as its primary purpose the determination of trace elements in samples of human milk. The Agency is serving as a WHO reference centre for these studies and WHO has provided the Agency with financial support for the placement of a technical contract for some of the analyses.

G.1.4/3. A symposium on nuclear activation techniques in the life sciences (third in a series) was held in 1978. A technical report on the elemental analysis of biological materials, comparing nuclear and non-nuclear techniques for the determination of trace elements, was published in 1979. A technical document on the elemental composition of human and animal milk has been prepared for publication in 1980.

Plans for 1981–82

G.1.4/4. The joint co-ordinated research programme with WHO on trace elements in human nutrition (Table G.8, No.2) is expected to be concluded during this period, as is also the short-term study (to be performed mainly through research contracts) of some mineral elements in the epidemiology of ischaemic heart disease. A new co-ordinated research programme on trace substances in occupational health, to be initiated in 1980, will be in full operation.

G.1.4/5. A review of neutron activation and other nuclear-based techniques for the in vivo study of human body composition will be made (Table G.9, No.3). Recommendations on quality control procedures for use in biomedical neutron activation analysis will be prepared (Table G.9, No.4).

Related activities

G.1.4/6. Many of the activities mentioned above are supported by work in the Medical Applications Laboratory (see "The Laboratory" programme). Close co-operation is also maintained with other units within the Agency which have an interest in activation analysis, and advice and assistance is provided where appropriate.

Outline of changes during 1983–86

G.1.4/7. A new project on the modifying role of trace elements in relation to environmental carcinogens may be started during this period in collaboration with the International Agency for Research on Cancer (IARC).

Co-operation with other organizations

G.1.4/8. Close collaboration will be maintained with WHO, particularly in respect of those research activities which have already been formally established as joint programmes. Contact will be established with other organizations, such as FAO, IARC and UNEP.

## SUB-PROGRAMME G.2

### Dosimetry for intentional radiation exposures

OBJECTIVE

G.2/1. The objective is to give Member States advice and assistance in connection with standardized techniques and procedures for the dosimetry of ionizing radiations, and to provide services and make recommendations aimed at improving the accuracy and reliability of dosimetric measurements in biomedical and industrial radiation applications.

OUTLINE FOR 1981–86

G.2/2. The Agency will continue to assist Member States in the planning and setting-up of Secondary Standard Dosimetry Laboratories (SSDLs), to co-ordinate their activities and to establish access to the Primary Metrology System. The Agency's Dosimetry Laboratory will continue to serve as a central laboratory within the SSDL Network.

G.2/3. In view of the increasing demand for higher dosimetric accuracy in medical radiation applications, the IAEA/WHO Postal Dose Intercomparison Service for X-rays, cobalt-60 gamma radiation and high-energy electron and photon radiation will continue for those countries where local (or regional SSDL) services are not yet available. Dose calibration intercomparisons between SSDLs and the Agency's Dosimetry Laboratory will be continued. It is envisaged that the Dosimetry Laboratory in its capacity as central laboratory of the SSDL Network will participate in special dose intercomparisons organized by (or under the auspices of) the Bureau International des Poids et Mesures (BIPM).

G.2/4. In view of the growing number of high-dose facilities in Member States designed for industrial radiation processing, increased emphasis will be given to standardization and intercomparison measurements of dosimetry for industrial radiation applications.

STRUCTURE

G.2/5. This sub-programme consists of four components, which are described in the following paragraphs.

## Dosimetry for intentional radiation exposures

### Summary by programme components

Table G.5

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Network of Secondary Standards Dosimetry Laboratories (SSDL Network) | 0.1 | 1.1 | 49 100 | 13 000 | 18 000 | 4 900 | 85 000 |
| Dose intercomparison services | 1.1 | 1.1 | 113 900 | – | 18 000 | 3 100 | 135 000 |
| Dose intercomparison development | 1.0 | 1.1 | 97 500 | – | 28 500 | 2 000 | 128 000 |
| Dosimetry for industrial radiation processing | 1.1 | 1.0 | 109 000 | 13 000 | 28 500 | 2 500 | 153 000 |
| Linguistic services | – | – | – | – | – | 8 000 | 8 000 |
| Printing and publishing services | – | – | – | – | – | 107 000 | 107 000 |
| Data processing services | – | – | – | – | – | 1 000 | 1 000 |
| Laboratory services | – | – | – | – | – | 237 000 | 237 000 |
| Conference services | – | – | – | – | – | 4 000 | 4 000 |
| TOTAL | 3.3 | 4.3 | 369 500 | 26 000 | 93 000 | 369 500 | 858 000 |

## Network of Secondary Standard Dosimetry Laboratories (SSDL Network) (component G.2.1)

### Objective

G.2.1/1. The objective is: to share with WHO the operation of the secretariat of the IAEA/WHO Network of Secondary Standard Dosimetry Laboratories; to assist Member States in planning and setting up SSDLs; to assist SSDLs in applying standardized dosimetry methods; and to ensure access to primary dosimetry standards. These activities are being performed under the "Working Arrangement between IAEA and WHO on a Network of Secondary Standard Dosimetry Laboratories".

### Results to date

G.2.1/2. The IAEA/WHO Network of SSDLs (laboratories authorized by governments to perform calibrations and verifications of instruments used for the measurement of radiation exposures and radioactivity) has become an internationally recognized institution. It consists at present of 42 member laboratories, 12 affiliated national standardizing laboratories and five collaborating organizations including the Bureau International des Poids et Mesures, the International Commission on Radiation Units and Measurements and the International Organization of Legal Metrology. The Dosimetry Section is responsible for the technical aspects of the Network secretariat.

G.2.1/3. Dose calibration intercomparisons have been performed on the spot by visiting experts in SSDLs in Latin America (Argentina, Bolivia, Brazil, Chile, Mexico and Venezuela) and the Far East (Indonesia, Malaysia, Singapore and Thailand) under technical assistance projects. A number of SSDLs have been regularly performing local dose intercomparisons using the procedure established by the Agency's Dosimetry Laboratory.

G.2.1/4. After the move to its new premises at Seibersdorf, the Agency's Dosimetry Laboratory is now exercising its full function as a central laboratory of the SSDL Network.

Plans for 1981–82

G.2.1/5. It is envisaged that by the end of 1982 the SSDL Network will comprise about 50 member laboratories, approximately two-thirds of them in full operation.

G.2.1/6. The Agency will continue to give technical advice on the planning and establishment of SSDLs, mainly through technical assistance. Arrangements will continue to be made to ensure the access of SSDLs to the Primary Metrology System through affiliated national standardizing laboratories and BIPM. Dose intercomparisons and calibrations for member SSDLs will be extended to high-energy electron and photon radiation and to dose rates needed for the calibration of instrumentation used for radiation protection.

G.2.1/7. Training of technical staff from SSDLs in the Dosimetry Laboratory will be expanded.

G.2.1/8. Guidelines for SSDLs on the measurement of activity and fast neutrons will be prepared (Table G.9, No.5). A report describing the function, layout and work of the Agency's Dosimetry Laboratory and the details of the Postal Dose Intercomparison Service will be prepared and published in the Technical Reports Series in 1982.

G.2.1/9. All technical activities concerned with the SSDL Network will continue to be guided by the IAEA/WHO SSDL Advisory Group.

Related activities

G.2.1/10. The Network is supported by substantial technical assistance and through an inter-regional technical assistance project under which dose intercomparison visits by the staff of the Agency's Dosimetry Laboratory are regularly undertaken. Requests for technical assistance and research contracts in connection with the establishment of SSDLs and the organization of local/regional dose intercomparisons will be evaluated, training courses for SSDL staff will be organized and staff training will be given at the Agency's Dosimetry Laboratory. The WHO Network secretariat will be assisted in the compilation of the SSDL "Circular Letter".

Co-operation with other organizations

G.2.1/11. The SSDL secretariat closely co-operates with BIPM, the International Commission of Radiation Units and Measurements, the SSDL pilot secretariat of the International Organization of Legal Metrology and twelve affiliated national standardizing laboratories.

Dose intercomparison services (component G.2.2)

Objective

G.2.2/1. The objective is to conduct in co-operation with WHO dose intercomparisons by mail aimed at improving the accuracy and reliability of absorbed dose measurements in radiotherapy and to organize and conduct dose calibration intercomparisons between member laboratories of the SSDL Network and the Agency's Dosimetry Laboratory.

Results to date

G.2.2/2. Through agreement with WHO and its regional offices, 150–200 intercomparisons for cobalt-60 radiation are being performed annually. Since 1975, such intercomparisons have been performed in more than 70 Member States. Statistical evaluations carried out by the Agency and WHO show a continuing need for this service throughout the world. There is also evidence that, as a result of this service, greater awareness of dosimetric accuracy has been achieved.

G.2.2/3. The accuracy and precision of the Agency's dose intercomparisons have been investigated and the results were published in 1980. For the cobalt-60 dose intercomparison, the overall uncertainty was found to be ±2%. In order to check its work performance, the Dosimetry Laboratory took part in a comparison of the Fricke chemical dosimeter system organized by BIPM with five national standardizing laboratories participating.

G.2.2/4. A report on high-energy photon and electron dosimetry was published in the Technical Reports Series in 1979.

G.2.2/5. Dose calibration and dose intercomparisons were among the subjects discussed at an Agency symposium on biomedical dosimetry held in Paris in 1980.

G.2.2/6. "Cobalt-60 Teletherapy – A Compendium of International Practice" (formerly Atlas VI) was published in 1980 in the IAEA Atlas Series on Radiation Dose Distributions.

Plans for 1981–82

G.2.2/7. The Agency's dose intercomparison services for cobalt-60 gamma radiation, X-rays and high-energy electrons used in radiation therapy will continue at the rate of 150–200 intercomparisons a year. The selection of institutes participating in this service and the distribution of dosimeters are being carried out through WHO channels.

G.2.2/8. A statistical evaluation of the results of the cobalt-60 dose intercomparison service covering the period 1975–80 will be undertaken and published in a scientific journal.

G.2.2/9. Calibration intercomparisons involving selected member laboratories of the SSDL Network will be carried out by the Dosimetry Laboratory at a rate of about two a year.

G.2.2/10. The following publications will be prepared or completed during this period: Atlas V "Brachytherapy Isodose Charts for Cobalt-60 and Caesium-137 Sources" in the IAEA Atlas Series on Radiation Dose Distributions; a new edition of the Directory of High-Energy Radiotherapy Centres; and an updated edition of the "Radiation Dosimetry Catalogue".

G.2.2/11. An intercomparison of dosimetry standards of the Agency's Dosimetry Laboratory with those of VNIIFTRI (State Standardizing Laboratory in Moscow) is envisaged in 1981.

Related activities

G.2.2/12. The work is closely related to the activities of the SSDL Network and to those described under the "Dose intercomparison development" component.

Outline of changes during 1983–86

G.2.2/13. It is envisaged that the number of dose intercomparisons for radiotherapy institutes will decrease, because this service will eventually be taken over by individual SSDLs.

Co-operation with other organizations

G.2.2/14. Close co-operation with BIPM and with a number of primary standardizing laboratories for regular calibration of the Agency's secondary standard dosimeters has been established. Under a technical contract, the National Physical Laboratory in the United Kingdom regularly participates in the Agency's dose intercomparisons as a reference laboratory.

## Dose intercomparison development (component G.2.3)

Objective

G.2.3/1. The objective is to develop and test new dosimetry instrumentation and procedures, to be applied at SSDLs and the Agency's Dosimetry Laboratory, for conducting reliable dose intercomparison measurements.

Results to date

G.2.3/2. An external filter technique for orthovoltage X-ray dose intercomparisons has been developed at the Agency's Dosimetry Laboratory, permitting the determination of both absorbed dose and radiation quality; the method has been successfully tested in two trial intercomparisons involving 15 and 12 laboratories.

G.2.3/3. In view of the increasing use of high-energy electrons and photons for the treatment of malignant diseases, methods have been developed for extending the cobalt-60 intercomparison service to those radiations. At an Advisory Group meeting on this subject in 1979, recommendations for the dosimetry of high-energy electron and photon radiation were drafted; they will be published in the Agency's Technical Reports Series in 1980.

G.2.3/4. An inexpensive and reliable remote-control fast-shutter system for an X-ray calibration stand, a special transmission monitor chamber and a remote-control filter-changing device have been developed and constructed in the Agency's Dosimetry Laboratory. A commercially available strontium-90 reference source has been modified in order to meet international transportation regulations. The design of these devices is made available to SSDLs on request.

G.2.3/5. The time-consuming readout system for the evaluation of thermoluminescent dosimeters employed by the Agency's Dosimetry Laboratory until 1979/80 has been replaced by an automated system; this has resulted in a considerable reduction in routine work.

Plans for 1981–82

G.2.3/6. In view of the increasing emphasis on dosimetry for industrial radiation processing, reliable methods suitable for high-dose intercomparisons will be developed in the Dosimetry Laboratory.

G.2.3/7. Under a technical contract with the Österreichische Studiengesellschaft für Atomenergie, an absorbed dose calorimeter intended to serve as a prototype for use in advanced SSDLs will be designed.

G.2.3/8. The Dosimetry Laboratory will participate in the European Neutron Dose Intercomparison Programme (ENDIP).

G.2.3/9. Standardized procedures for heavy charged particle dosimetry will be reviewed and guidelines for member SSDLs will be formulated (Table G.9, No.6).

Related activities

G.2.3/10. This activity is related to the "Dose intercomparison services" component, for which it provides laboratory instrumentation. Part of this instrumentation is also provided by outside laboratories under technical contracts.

Outline of changes during 1983–86

G.2.3/11. Laboratory work on the development of dosimeter systems for dose intercomparisons in the case of radiation beams used for therapy and industrial radiation processing will be completed. However, it is envisaged that a need will continue for the Agency's Dosimetry Laboratory to serve as a central laboratory for the SSDL Network. In addition, the development of dosimetry systems for neutrons and for heavy charged particles such as protons and pions may become necessary as a result of work on fusion test reactors and the more widespread use of heavy charged particles in medicine.

Co-operation with other organizations

G.2.3/12. Within the framework of the technical contracts programme, close co-operation will be maintained with the Hungarian National Office of Measures and the Österreichische Studiengesellschaft für Atomenergie (Institut für Strahlenschutz).

## Dosimetry for industrial radiation processing (component G.2.4)

Objective

G.2.4/1. The objective is to assist in improving dosimetry reliability and accuracy in the high-dose range by developing reliable dosimetry systems, achieving standardization of dosimetry procedures (1982) and organizing high-dose intercomparisons.

Results to date

G.2.4/2. As no international activity existed in the field of high-level radiation dosimetry, the Agency in 1976 initiated a programme on high-dose standardization and intercomparison for industrial radiation processing. A worldwide survey of high-dose facilities revealed great interest in such a programme, particularly in the field of sterilization of medical products and food preservation. On the basis of this survey, a "World Directory of High-Dose Facilities" was published in 1980.

G.2.4/3. Prior to the organization of a worldwide high-dose intercomparison service, a number of pilot studies in the high-dose range (5–100 kGy) had been performed in order to select suitable dosimetry systems. Studies were undertaken by a co-ordinated research group to determine environmental effects affecting the response of these dosimetry systems (Table G.8, No.11). Under this co-ordinated research programme, a new water-equivalent dosimetry system which is particularly useful for use in food irradiation has been developed, and it will be used in future high-dose intercomparisons.

G.2.4/4. Two manuals, entitled "High-Dose Measurements in Industrial Radiation Processing" and "Manual of Food Irradiation Dosimetry", were compiled with the aid of consultants and have been published in the Agency's Technical Reports Series (1980 and 1977 respectively).

Plans for 1981–82

G.2.4/5. The results of the pilot intercomparison studies between 1977 and 1980 will be reviewed and recommendations concerning the performance of a worldwide high-dose intercomparison to be started in 1982 will be made (Table G.9, No.7).

G.2.4/6. An educational seminar on high-dose dosimetry for industrial radiation processing in developing countries will be organized in 1982 (Annex II (12)).

G.2.4/7. The co-ordinated research programme on high-dose standardization and intercomparisons for industrial radiation processing will continue (Table G.8, No.11).

Related activities

G.2.4/8. The co-operation with the "Food preservation", "Radiation biology" and "Industrial applications and chemistry" sub-programmes will be continued.

Outline of changes during 1983–86

G.2.4/9. It is planned to extend the high-dose intercomparison programme to electron radiation and to dose ranges not at present covered.

G.2.4/10. The co-ordinated research programme will be continued, with a shift in emphasis towards electron-beam applications.

Co-operation with other organizations

G.2.4/11. Close co-operation is maintained with the National Physical Laboratory in the United Kingdom and the Department of Isotopes of the National Academy of Sciences, Hungary.

## SUB-PROGRAMME G.3

### Radiation biology

OBJECTIVE

G.3/1. The objective is to advise and assist Member States, particularly developing countries, in connection with the application of the results of recent radiobiological research in producing medical supplies and pharmaceuticals, in the control of parasitic diseases, in cancer therapy, in the treatment of domestic wastes and in the evaluation of hazards due to environmental pollutants.

OUTLINE FOR 1981-86

G.3/2. Work will continue to be directed to the establishment of a sound basis and suitable methodologies for the application of radiobiological research results in the radiation sterilization of medical supplies and pharmaceuticals, in the radiation attenuation of parasites and other infective agents for use in the preparation of vaccines against human diseases, in the improvement of the radiation therapy of cancer through the use of radiosensitivity modifiers and heavy particles and in the radiation treatment of domestic wastes.

G.3/3. Increased emphasis will be placed on the radiobiological studies necessary in developing test systems required for an objective evaluation of the comparative biological hazards resulting from the low-level radiation associated with nuclear energy production and the major chemical pollutants released to the human environment from non-nuclear power generation facilities.

STRUCTURE

G.3/4. This sub-programme consists of five components, which are described in the following paragraphs.

### Radiation biology

Summary by programme components

Table G.6

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Radiation sterilization of medical supplies including pharmaceuticals | 0.3 | 0.2 | 26 200 | – | 25 000 | 800 | 52 000 |
| Preparation of irradiated vaccines against some human diseases | 1.0 | 0.7 | 86 200 | 43 000 | 35 000 | 2 800 | 167 000 |
| Application of recent radio-biological research results in radiotherapy | 1.0 | 0.6 | 87 700 | 20 000 | 38 000 | 4 300 | 150 000 |
| Radiation treatment of domestic wastes | 0.2 | 0.2 | 19 900 | 12 000 | 6 000 | 1 100 | 39 000 |
| Comparative biological hazards of energy-related chemical pollutants and low-level radiation in the environment | 0.8 | 0.6 | 74 700 | 41 000 | 42 000 | 3 300 | 161 000 |
| Linguistic services | – | – | – | – | – | 5 000 | 5 000 |
| Printing and publishing services | – | – | – | – | – | 69 000 | 69 000 |
| Conference services | – | – | – | – | – | 43 000 | 43 000 |
| TOTAL | 3.3 | 2.3 | 294 700 | 116 000 | 146 000 | 129 300 | 686 000 |

## Radiation sterilization of medical supplies including pharmaceuticals (component G.3.1)

### Objective

G.3.1/1. The objective is to assist in the development of safe practices for the sterilization of locally manufactured medical products and pharmaceuticals, with special reference to the microbial contaminants occuring in the countries of Asia, the Far East, the Middle East and Africa.

### Results to date

G.3.1/2. Research under a co-ordinated programme for countries in Europe was concluded in 1976. The work centred on the use of radiation for sterilizing hermetically sealed, ready-to-use medical supplies such as sutures, implants and certain transplants, including bone and nerve tissue grafts. The progress made was reviewed at two research co-ordination meetings, an Advisory Group meeting and a symposium. Some supplementary research on the detection and control of radiation-induced alterations in the antigenic properties of biological tissues, carried out primarily at various institutes in Europe, has been completed.

G.3.1/3. Under the current co-ordinated research programme, which involves institutes in eight countries (Australia, Bangladesh, Burma, India, Indonesia, Pakistan, the Philippines and Thailand), locally manufactured medical items have been studied in terms of their suitability for sterilization by ionizing radiation (Table G.8, No.6). In Pakistan a dye-based colour-change film dosimeter has been designed and is currently being calibrated for sensitivity and reliability. Work under this programme has also been done on microbiological quality assessment, including the pre-sterilization bioburden of local medical items.

G.3.1/4. Recommendations on practices and regulations for the radiation sterilization of medical products, made by groups of international experts and published in 1975, have been used by many Member States in the formulation of their national codes of practice governing sterilization procedures and control of the sterility of medical supplies.

G.3.1/5. About 35 fellowships and scientific visits relating to the radiation sterilization of medical products have been awarded under the Agency's technical assistance programme. In addition, the advisory services of ten experts have been provided at the request of Member States in Asia and the Far East.

### Plans for 1981–82

G.3.1/6. A new co-ordinated research programme on optimum conditions for sterilizing medical products in local health services will be initiated in 1981 for countries in Africa.

### Related activities

G.3.1/7. Requests for fellowship training and the services of experts to advise on the development of radiation sterilization practices in developing Member States will continue to be evaluated.

### Outline of changes during 1983–86

G.3.1/8. The "IAEA Recommended Code of Practice for Radiation Sterilization of Medical Products", published in 1975, will be reviewed to allow for the operational experience accumulated in Member States.

### Co-operation with other organizations

G.3.1/9. Close co-operation is maintained with WHO in the development and standardization of radiation sterilization practices.

## Preparation of irradiated vaccines against some human diseases (component G.3.2)

### Objective

G.3.2/1. The objective is to determine the applicability of radiation-attenuated vaccines in the immunological control of malaria, schistosomiasis, filariasis and hookworm disease (1981–82) and to investigate the problems associated with the application of radiation attenuation and other nuclear techniques in the diagnosis and control of such infections (1983–86).

### Results to date

G.3.2/2. On the basis of results from the earlier co-ordinated research programme, which showed from animal experimentation that irradiated vaccines were potentially useful against some parasitic diseases, a new programme with nine participating Member States was initiated in 1979 (Table G.8, No.3). An Advisory Group that year reviewed the available techniques and the current state of development of irradiated vaccines for malaria, schistosomiasis and filariasis and formulated the objectives for the programme. The proceedings of its meeting were published in 1980 in the International Journal of Nuclear Medicine and Biology.

G.3.2/3. An interregional training course, organized in co-operation with the United States Department of Energy and held at Bethesda, Maryland, in 1980, dealt with the use of nuclear methodologies and techniques in the study and control of parasitic diseases of humans. The lectures and laboratory exercises from the course are to be published in the Agency's Technical Reports Series in 1980.

### Plans for 1981–82

G.3.2/4. Under the co-ordinated research programme (Table G.8, No.3), work will be carried out on the development of irradiated vaccines for malaria, schistosomiasis, filariasis and hookworm disease, the study of host-parasite interactions and the consequences of immunization for the host.

G.3.2/5. A symposium on nuclear techniques in the study of parasitic infections of man and animals will be held in 1981 (Annex I (11)).

G.3.2/6. A review will be made of the status of research on immunological and pathological criteria associated with the use of radiation-attenuated vaccines (Table G.9, No.8).

### Related activities

G.3.2/7. Support will be provided for technical assistance projects in countries where parasitic diseases are endemic, through help in planning and executing programmes for the diagnosis, control and eradication of such infections.

### Outline of changes during 1983–86

G.3.2/8. Research will be supported through the co-ordinated programme on the development of model test systems for evaluating the efficacy and safety of promising vaccines and on the development of radioisotopic techniques for the detection of parasite-specific antigens in body fluids.

G.3.2/9. Efforts will be intensified through training courses and seminars to transfer modern sophisticated nuclear techniques for the control of parasitic infections to Member States where such diseases are endemic.

### Co-operation with other organizations

G.3.2/10. This programme component involves co-operation with WHO.

## Application of recent radiobiological research results in radiotherapy (component G.3.3)

### Objective

G.3.3/1. The objective is to promote and review the results of recent radiobiological studies on radiation therapy in cancer, with special reference to high-LET (Linear Energy Transfer) radiations from external and internal sources and to radiosensitivity modifiers.

### Results to date

G.3.3/2. At an Advisory Group meeting in 1977, the use of high-LET radiations such as fast neutrons and pi-mesons in cancer therapy was reviewed and discussed from the clinical and economic points of view, and it was concluded that such radiations are of value in cancer therapy. An Advisory Group meeting in 1979 suggested that other forms of high-LET radiation therapy, i.e. interstitial sources, neutron capture and local emission, should also be considered. A new co-ordinated research programme on this subject has been initiated this year (Table G.8, No.12).

G.3.3/3. An evaluation of the radiotherapeutic results from modifying agents, especially anoxic sensitizers, has been made through a co-ordinated research programme (Table G.8, No.4).

### Plans for 1981–82

G.3.3/4. The co-ordinated research programme on improvements in cancer radiotherapy using radiosensitivity modifiers, particularly hyperthermia, will be continued and evaluated during this period (Table G.8, No.4).

G.3.3/5. A compilation of current technical, radiobiological and clinical data on high-LET radiation sources used in cancer therapy will be made and published as a Technical Report in 1981.

G.3.3/6. A seminar on radiation therapy methods in developing countries will be held in 1981 (Annex I (12)).

### Related activities

G.3.3/7. Applications for fellowships and training courses on radiobiology in radiotherapy will continue to be evaluated.

### Outline of changes during 1983–86

G.3.3/8. The emphasis in the co-ordinated research programmes will shift towards the therapeutic effects of high LET-radiation combined with other treatments.

G.3.3/9. An Advisory Group meeting is planned for 1983 to review the current status of problems of corpuscular radiations in non-conventional therapy of cancer and to advise on future activities in this field.

### Co-operation with other organizations

G.3.3/10. This component will continue to involve close collaboration with WHO.

## Radiation treatment of domestic wastes (component G.3.4)

### Objective

G.3.4/1. The objective is to determine optimum conditions for radiation treatment of domestic wastes for safe reutilization, with emphasis on radiobiological aspects of decontamination from pathogenic microorganisms (1980–86).

Results to date

G.3.4/2. At a symposium held in 1975, radiobiological and technological problems involved in development work aimed at the efficient and safe reutilization of domestic and industrial sewage were considered. A Technical Committee meeting held in 1977 recommended further biological research on the use of ionizing radiation in conjunction with other, physical and chemical, treatments as a means of solving municipal waste treatment problems.

Plans for 1981–82

G.3.4/3. With the successful establishment of pilot-plant sewage irradiation facilities involving different types of radiation sources in a number of technologically advanced Member States and the development of efficient irradiation techniques for disinfecting and dewatering sewage sludge of varied chemical, physical and biological composition, the prospects for both the economic feasibility and large-scale use of this technology have improved. Further development of the practices relies on the availability of data relating to disinfection doses, the influence of the organic and inorganic media and the importance of dose rate and radiation energy. The subject will be reviewed in 1981 with a view to assessing the applicability of this technique to the conditions in developing countries (Table G.9, No.9), and a co-ordinated research programme is to be started in 1982 to promote its use in these countries.

Related activities

G.3.4/4. On-site training of fellows and a study tour will be arranged under the technical assistance programme.

Outline of changes during 1983–86

G.3.4/5. A symposium to review the status of radiation technology for treating all types of waste will be proposed for 1983 as a follow-up to a symposium held in 1975.

G.3.4/6. The emphasis will shift towards reviewing progress in improving the efficiency of the radiation treatment of domestic wastes.

Co-operation with other organizations

G.3.4/7. The necessary co-operation with the relevant programme activities of WHO, FAO, UNEP and ESNA is maintained.

## Comparative biological hazards of energy-related chemical pollutants and low-level radiation in the environment (component G.3.5)

Objective

G.3.5/1. The objective is to contribute towards the development of a methodology for comparing the biological hazards in the human environment caused by low-level radiation and chemical pollutants released from generating plants using nuclear and conventional (especially fossil fuel) sources of energy (1980–86).

Results to date

G.3.5/2. Methods and criteria for evaluating the biological effects of low-level radiation and extrapolating the results obtained with experimental animals to humans were examined at symposia held in 1975 and 1978.

G.3.5/3. In the light of growing interest shown by Member States, a symposium in 1979 reviewed the available information on the biological implications of radionuclides (especially transuranics and tritium) expected to be released from present and future nuclear facilities: their transport and uptake through food chains and the safety assurance provided by radiological protection standards.

G.3.5/4. Research has been supported and co-ordinated on the development of a reliable biological monitor of absorbed radiation dose based on induced chromosomal aberration frequencies in human peripheral blood lymphocytes (Table G.8, No.8). The results have helped in defining the essential criteria and an analytical cytogenetic protocol for facilitating a reliable assessment of the absorbed radiation dose.

G.3.5/5. Progress in this field, particularly the development of efficient genetic test systems for comparative biological hazard assessment, was reviewed at a research co-ordination meeting in 1979. A meeting of experts was held in 1979, in conjunction with the 6th International Congress of Radiation Research, to review the combined effects of chemicals and radiation in terms of their interactions (synergistic, additive or antagonistic) and their potential significance to environmental health: the conclusions of this meeting were published in the Proceedings of the Congress. Progress in the development of methods for evaluating the comparative biological hazards from major chemical pollutants and low radiation doses was considered by an Advisory Group in 1978. The results are to be published this year.

Plans for 1981–82

G.3.5/6. Radiobiological and related test systems using somatic, genetic and cytogenetic effects for assessment of the relative hazards of radioactive and chemical pollutants from alternative energy sources will continue to be studied under a co-ordinated research programme (Table G.8, No.7).

G.3.5/7. The suitability of peripheral blood lymphocytic chromosomes as a test system for detecting human exposure to very low radiation doses (up to one rem) such as might be encountered in the normal environment will continue to be investigated under a co-ordinated research programme (Table G.8, No.8). Under this programme, an analysis will also be made by banding techniques of the biological mechanisms for the induction of symmetrical-type chromosome aberrations in human peripheral lymphocytes.

G.3.5/8. At a symposium in 1981, to be held in co-operation with UNEP and WHO, a review will be made of the methods available for comparing the health impacts of nuclear power and alternative energy sources (Annex I (13)).

Related activities

G.3.5/9. During the period 1975–79, 25 fellowships were granted in connection with projects relating to the development of biological monitors for absorbed radiation doses.

G.3.5/10. Training of the manpower required for these activities will be supported through the technical assistance programme.

Outline of changes during 1983–86

G.3.5/11. The recommendations resulting from the discussions at the 1981 symposium will be followed up through appropriate programme activities.

Co-operation with other organizations

G.3.5/12. Close co-operation with UNEP and WHO will continue in the organization and implementation of the programme activities.

## SUB-PROGRAMME G.4

### Health-related environmental research

### OBJECTIVE

G.4/1. The objective is to stimulate and co-ordinate national activities concerned with applications of nuclear methods for assessing the contamination of man by environmental trace-element pollutants and to compile and disseminate data on the pollution burden imposed on man by nuclear and non-nuclear power generation.

### Health-related environmental research

Summary by programme component

Table G.7

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Health-related environmental research | 2.2 | 1.2 | 193 000 | – | 65 000 | 7 000 | 265 000 |
| Linguistic services | – | – | – | – | – | 4 000 | 4 000 |
| Printing and publishing services | – | – | – | – | – | 6 000 | 6 000 |
| TOTAL | 2.2 | 1.2 | 193 000 | – | 65 000 | 17 000 | 275 000 |

### RESULTS TO DATE

G.4/2. In 1978, a co-ordinated research programme on the development of nuclear techniques for the analysis of trace elements in human hair was started under the RCA (Table G.8, No.14); the programme was aimed mainly at ascertaining the value of hair analysis as a method of assaying human exposure to environmental trace element pollutants. The results indicate that the elemental composition of hair, as determined by nuclear and other analytical techniques, is a good measure of human exposure to such pollutants. A variety of nuclear analytical techniques have been used in this programme, including activation by reactor-generated thermal neutrons, accelerator-generated fast neutrons, photons and charged particles. A report on the activation analysis of human hair was issued in 1977 and again, in a revised form, in 1978. An Advisory Group met in 1978 to consider the use of accelerator-based techniques for the analysis of trace elements in man. In co-operation with the "Medical applications" sub-programme, a symposium on nuclear activation techniques in the life sciences was held in 1978.

G.4/3. In the second phase of the co-ordinated research programme on the development of nuclear techniques for the analysis of trace elements in human hair (Table G.8, No.13), the applicability of the techniques is being tested under practical conditions in a number of Member States.

G.4/4. For the purposes of analytical quality control, a powdered hair sample has been prepared and made available to Member States for intercomparison studies of trace elements in this material.

G.4/5. An Advisory Group convened in 1979 concluded that the available data showed that the hazardous health effects per unit of power produced were much smaller for nuclear than for non-nuclear means of generation. It also noted that, while direct quantitative estimates existed for exposure to radiation, no systematic analyses of exposure to chemical pollutants were available. A recommendation was therefore made that there should be increased efforts towards the development of a suitable methodology for comparing hazardous health effects from nuclear and non-nuclear (especially fossil fuel) power generation.

## PLANS FOR 1981–82

G.4/6. Research under the co-ordinated programmes will continue during this period and a preliminary evaluation of the results will be made in 1981.

G.4/7. Intercomparison studies of the powdered hair material will be carried out by laboratories participating in the programme and other investigators interested in the study. The data will be evaluated and a report prepared. The need for new analytical quality control services will be investigated.

G.4/8. It is planned to initiate a co-ordinated research programme seeking to study the correlation between trace element contamination in hair and body fluids.

G.4/9. The applicability of nuclear methods for studying the contamination of man by environmental trace element pollutants will be reviewed (Table G.9, No.10) and future activities in the field will be reconsidered.

## RELATED ACTIVITIES

G.4/10. A total of 330 scalp hair samples from a Mexican urban population suspected of contamination with chromium have been analysed for this element at the Agency's Laboratory and at laboratories participating in the programme. Work at the Agency's Laboratory has also resulted in the preparation of powdered hair material for intercomparison studies.

## CO-OPERATION WITH OTHER ORGANIZATIONS

G.4/11. Co-operation with other organizations concerned with the problems of human and environmental contamination (ICSU, UNEP, UNESCO and WHO) will be maintained wherever appropriate.

## Co-ordinated research programmes

Table G.8

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Formulation and implementation of maintenance plans for nuclear laboratories in developing countries | 9 | – | 1979/80 | 1983/84 |
| 2. Comparative methods for the study of trace elements in human nutrition | 3 | 3 | 1975 | 1980 |
| 3. Preparation of irradiated vaccines against some human diseases | 4 | 5 | 1978/79 | 1982 |
| 4. Improvement in radiotherapy of cancer using modifiers of radiosensitivity of cells | 8 | 4 | 1975 | 1982 |
| 5. Radiation biology of Auger emitters and their therapeutic applications | – | 3 | 1976 | 1981 |
| 6. Practices for the radiation sterilization of medical supplies in countries of Asia and the Pacific region | 8 | 1 | 1976 | 1981 |
| 7. Comparative biological hazards of energy-related chemical pollutants and low-level radiation in the environment | 6 | 3 | 1977 | 1982 |
| 8. Radiation-induced chromosomal aberrations for genetic risk evaluation in man | 10 | 4 | 1975 | 1981 |
| 9. Quality control of techniques in in vitro assay of thyroid related hormones | 3 | 3 | 1975 | 1980 |
| 10. Investigation of maintenance of nuclear instrumentation in developing countries | | | | |
| – Latin America | 9 | 1 | 1979 | 1980 |
| – Africa | 7 | – | 1979 | 1980 |
| 11. High-dose standardization and intercomparison for industrial radiation processing | 5 | 5 | 1978 | 1983 |
| 12. Exploration of the possibility of high LET radiation for non-conventional radiotherapy in cancer | This programme has been approved but no contract has yet been awarded | | | |
| 13. Nuclear methods in health-related monitoring of trace element pollutants | 1 | 1 | 1979 | 1983 |
| 14. Health-related environmental research using nuclear techniques | 5 | 1 | 1978 | 1983 |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table G.9

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | Guidance document on software development and software applications in developing countries | Agency Secretariat and Member States | Consultants' meeting in 1981 | 1981 | G.1.1/9 |
| 2 | IAEA-TECDOC on status of quality assurance programmes | Atomic Energy Commissions and nuclear medicine laboratories in developing countries and Agency Secretariat | AG 1982/1 | 1983 | G.1.3/5 |
| 3 | IAEA-TECDOC on status of neutron activation and other nuclear-based techniques for the in vivo study of human body composition (summary to be published in open literature) | Laboratories in Member States and Agency Secretariat | AG 1981/1 | 1981 | G.1.4/5 |
| 4 | IAEA-TECDOC on quality control procedures for use in biomedical neutron activation analysis | Research reactor users and organizers of training courses on activation analysis | AG 1982/2 | 1982 | G.1.4/5 |
| 5 | Technical Report on guidelines for SSDLs on measurements of activity and fast neutrons | SSDLs and other standardizing laboratories | AG 1981/2 | 1982 | G.2.1/8 |
| 6 | Technical Report with guidelines on charged particle dosimetry procedures | Health and hospital physicists; SSDLs and other standardizing laboratories | AG 1982/3 | 1983 | G.2.3/9 |
| 7 | Technical Report with guidelines on high-dose dosimetry for industrial radiation processing | High-dose industrial facilities and research institutes | AG 1981/3 | 1982 | G.2.4/5 |
| 8 | Technical Report on status of research on immunological and pathological criteria associated with the use of radiation-attenuated vaccines | Agency Secretariat and research institutes | AG 1981/4 | 1981 | G.3.2/6 |
| 9 | Technical Report on the applicability of radiation treatment of domestic wastes to conditions in developing countries | As above | AG 1981/5 | 1981 | G.3.4/3 |
| 10 | Technical Report on applicability of nuclear methods for studying the contamination of man by environmental trace element pollutants | As above | AG 1982/4 | 1982 | G.4/9 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Advisory Group on neutron activation and other nuclear-based techniques for the in vivo study of human body composition | G.1.4/5 |
| 2. | Meeting of the SSDL Advisory Group | G.2.1/8 |
| 3. | Advisory Group on high-dose pilot intercomparison | G.2.4/5 |
| 4. | Advisory Group on immunological and pathological criteria associated with the use of radiation-attenuated vaccines | G.3.2/6 |
| 5. | Advisory Group on the applicability of radiation treatment of domestic wastes to conditions in developing countries | G.3.4/3 |

| 1982 | | |
|---|---|---|
| 1. | Advisory Group on quality control of in vivo radionuclide procedures | G.1.3/5 |
| 2. | Advisory Group on quality control in biomedical neutron activation analysis | G.1.4/5 |
| 3. | Advisory Group on heavy charged-particle dosimetry | G.2.3/9 |
| 4. | Advisory Group on applicability of nuclear methods for studying the contamination of man by environmental trace pollutants | G.4/9 |

# H. PHYSICAL SCIENCES

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table H.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 207 511 | 1 637 000 | 109 000 | – | 109 000 | 1 746 000 | 1 848 000 | 1 997 000 |
| Consultants | 135 453 | 91 000 | 12 000 | (21 000) | (9 000) | 82 000 | 129 000 | 142 000 |
| Overtime | 196 | – | – | – | – | – | – | – |
| Temporary assistance | 30 643 | 16 300 | 800 | (10 400) | (9 600) | 6 700 | 14 000 | 15 000 |
| Sub-total | 1 373 803 | 1 744 300 | 121 800 | (31 400) | 90 400 | 1 834 700 | 1 991 000 | 2 154 000 |
| Common staff costs | 368 577 | 474 500 | 58 100 | – | 58 100 | 532 600 | 573 000 | 619 000 |
| Travel | 28 382 | 35 000 | 5 000 | – | 5 000 | 40 000 | 83 000 | 91 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 65 005 | 88 000 | 13 000 | (10 000) | 3 000 | 91 000 | 100 000 | 254 000 |
| Technical committees, advisory groups | 98 313 | 66 000 | 10 000 | 17 000 | 27 000 | 93 000 | 158 000 | 234 000 |
| Representation and hospitality | 5 527 | 7 500 | 400 | – | 400 | 7 900 | 10 000 | 11 000 |
| Scientific and technical contracts | 313 664 | 346 000 | 26 000 | (46 000) | (20 000) | 326 000 | 510 000 | 543 000 |
| Scientific supplies and equipment | 18 250 | 28 600 | 3 000 | (5 800) | (2 800) | 25 800 | 40 000 | 44 000 |
| Common services, supplies and equipment | 6 033 | 8 100 | 300 | (3 400) | (3 100) | 5 000 | 6 000 | 6 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 137 704 | 102 000 | 6 000 | (5 000) | 1 000 | 103 000 | 115 000 | 120 000 |
| Printing and publishing services | 503 984 | 558 000 | 65 000 | – | 65 000 | 623 000 | 673 000 | 720 000 |
| Data processing services | 136 489 | 202 000 | (6 000) | (66 000) | (72 000) | 130 000 | 160 000 | 240 000 |
| Laboratory services | 2 068 585 | 2 388 000 | 195 000 | (158 000) | 37 000 | 2 425 000 | 2 580 000 | 2 700 000 |
| Conference services | – | 48 000 | 4 000 | 12 000 | 16 000 | 64 000 | 62 000 | 78 000 |
| TOTAL | 5 124 316 | 6 096 000 | 501 600 | (296 600) | 205 000 | 6 301 000 | 7 061 000 | 7 814 000 |

## SUMMARY OF MANPOWER

Table H.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 6 | 6 | 6 | – | 6 | 6 | 6 |
| P-4 | 11 | 11 | 11 | – | 11 | 11 | 12 |
| P-3 | 7 | 7 | 7 | – | 7 | 7 | 7 |
| P-2 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| Sub-total | 28 | 28 | 28 | – | 28 | 28 | 29 |
| GS | 17 | 18 | 18 | – | 18 | 18 | 18 |
| TOTAL | 45 | 46 | 46 | – | 46 | 46 | 47 |

## CHANGES IN COSTS AND MANPOWER

### Costs

H/1. As will be seen from Table H.1 above, it is expected that the cost of this programme will increase by $205 000 as a net result of salary and other price increases of $501 600 partly offset by a programme decrease of $296 600.

H/2. Programme decreases are foreseen in respect of consultants' services ($21 000), temporary assistance ($10 400), scientific and technical contracts ($46 000, primarily in the "Physics" and "Industrial applications and chemistry" sub-programmes), scientific supplies and equipment ($5 800) and common services, supplies and equipment ($3 400).

H/3. There will be a programme decrease of $10 000 in respect of conferences, symposia and seminars, although it is planned to hold the same number of meetings in this category as in 1980. The programme increase of $17 000 in respect of technical committees and advisory groups is attributable to an increase in the number of meetings in this category.

H/4. As regards the allocation of service costs, programme decreases are foreseen in respect of linguistic services ($5 000), data processing services ($66 000) and laboratory services ($158 000). The programme increase of $12 000 in respect of conference services is related to the increase in the number of meetings.

H/5. As can be seen from Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–81), it is expected that the Federal Republic of Germany will support the "Isotope hydrology" sub-programme with a contribution of $60 000 and that Australia and Japan will make contributions (under RCA) of $90 000 and $25 000 respectively.

H/6. It is expected that income from CINDA publications will be $20 000 in 1981.

### Manpower

H/7. As will be seen from Table H.2 above, no change in manpower is foreseen for 1981 and 1982. For 1983 one additional P-4 post will be required for the "Physics" sub-programme.

## Summary of manpower and costs by sub-programme

Table H.3

| Sub-programme | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | Man-years | | Costs | Man-years | | Costs |
| | P | GS | | P | GS | | P | GS | |
| Physics | 4.3 | 2.3 | 793 000 | 4.3 | 2.3 | 1 066 000 | 5.3 | 2.3 | 1 264 000 |
| Industrial applications and chemistry | 5.2 | 2.2 | 2 494 000 | 5.2 | 2.2 | 2 702 000 | 5.2 | 2.2 | 2 915 000 |
| Isotope hydrology | 4.2 | 3.2 | 1 364 000 | 4.2 | 3.2 | 1 410 000 | 4.2 | 3.2 | 1 536 000 |
| Nuclear data | 14.3 | 10.3 | 1 650 000 | 14.3 | 10.3 | 1 883 000 | 14.3 | 10.3 | 2 099 000 |
| TOTAL | 28.0 | 18.0 | 6 301 000 | 28.0 | 18.0 | 7 061 000 | 29.0 | 18.0 | 7 814 000 |

## THE PROGRAMME

### OBJECTIVE

H/8. The objective is to stimulate research, to co-ordinate the activities of scientists and to promote the exchange of information among Member States, particularly developing countries, on selected topics in the fields of physics, chemistry, the industrial application of isotopes, nuclear data and isotope hydrology.

### STRUCTURE

H/9. The programme consists of four sub-programmes, which are dealt with separately below.

*(see Table H.3)*

## SUB-PROGRAMME H.1

### Physics

### OBJECTIVE

H.1/1. The objective is to provide consultative and evaluative services in selected areas of applied and fundamental physics, through information exchange and (where appropriate) the preparation of reviews and position papers for special international programmes, and to give scientific and technical support to the Agency's technical assistance projects related to nuclear and solid state physics.

### OUTLINE FOR 1981–86

H.1/2. Activities will be concentrated on selected aspects of nuclear physics of particular interest to developing countries. The efficient use of research reactors will be promoted on a regional basis through the provision of advice and the organization and co-ordination of research programmes in selected fields. Assistance will be given to reactor centres in developing countries on the problem of reactor core conversion from highly enriched to low-enriched nuclear fuel. Work in plasma physics and fusion research – including the exchange of information on experimental results, theories and reactor designs – will continue and international collaboration on work aimed at the demonstration of fusion power will be promoted through the International Fusion Research Council (IFRC). The INTOR project, started in 1979, is expected to continue and expand during this period. Laboratories in countries other than those engaged in major fusion research projects will be advised of significant research opportunities in areas recommended by Advisory Groups.

### STRUCTURE

H.1/3. This sub-programme consists of three components, which are described in the following paragraphs.

## Physics

### Summary by programme components

Table H.4

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Nuclear physics | 1.1 | 0.6 | 91 900 | 9 000 | 42 000 | 7 100 | 150 000 |
| Utilization of research reactors | 1.0 | 0.5 | 87 600 | 11 000 | 28 000 | 4 400 | 131 000 |
| Plasma physics and controlled fusion research | 2.2 | 1.2 | 196 300 | 31 000 | 35 000 | 6 700 | 269 000 |
| Linguistic services | – | – | – | – | – | 20 000 | 20 000 |
| Printing and publishing services | – | – | – | – | – | 208 000 | 208 000 |
| Conference services | – | – | – | – | – | 15 000 | 15 000 |
| TOTAL | 4.3 | 2.3 | 375 800 | 51 000 | 105 000 | 261 200 | 793 000 |

### Nuclear physics (component H.1.1)

Objective

H.1.1/1. The objective is to promote studies and support research in selected fields of applied nuclear physics relevant to the programmes of developing countries.

Results to date

H.1.1/2. In 1977, an Advisory Group meeting considered the application of nuclear techniques in research and development with emphasis on those methods which are suitable for introduction into developing countries. The results of the meeting were published in the Agency's Panel Proceedings Series in 1978. A co-ordinated research programme on the application of Mössbauer spectroscopy to soil studies and minerology was started in 1977 to promote work on this subject in developing countries (Table H.8, No.2).

H.1.1/3. In 1975, an IAEA-TECDOC on the results from a regional seminar concerned with the utilization of low-energy accelerators was issued. The emphasis was on applied research which can be introduced on any low-energy accelerator with relatively modest instrumentation. As a result of this seminar and recommendations by the Agency, accelerator laboratories in a number of countries (e.g. Bangladesh, Egypt, Hungary and Iran) have modified their programmes and have become successful in performing tasks of importance to local industries. Within the framework of technical assistance, over twenty neutron generators have been supplied to developing countries; a training course was organized in 1978 to promote the utilization of these generators. A large co-ordinated research programme on proton-induced X-ray emission – a very powerful technique for the determination of trace elements, with a wide range of applications (e.g. analysis of toxic materials in food products and of pollutants in air and water) – produced important results on the sensitivity limits and precision of multi-elemental quantitative analysis. A report on the results was issued in 1978 and papers have appeared in Atomic Energy Review.

H.1.1/4. Training courses on nuclear electronics are organized each year for scientists and engineers from developing countries and held under the technical assistance programme. In 1977 and 1979, training courses for nuclear laboratory technicians were held in Malaysia and Costa Rica: a similar course is to take place in Morocco this year. A four-country study tour on the utilization of low-energy accelerators was arranged for 28 participants from developing countries in 1976.

H.1.1/5. The series of Agency symposia on the physics and chemistry of fission (1965, 1969, 1973 and 1979) is accepted as the central forum of international information exchange in the field. At the 1979 symposium, special attention was given to the use of heavy ions in studies of fission mechanisms. By means of technical assistance projects and research contracts, specific investigations have been promoted in laboratories in developing countries, resulting in valuable data on fast-neutron-induced fission, fission fragment distribution and long-range particles emitted in ternary fission.

Plans for 1981–82

H.1.1/6. The process of providing developing countries with information and advice on practical applications of nuclear techniques will continue, with special reference to the introduction of nuclear science into the curriculum of institutes of higher education and to the problem of data acquisition and processing by advanced minicomputer and microprocessor techniques (Table H.9, Nos.1 and 2). It is planned in 1981 to start a co-ordinated research programme in co-operation with the "Material testing and analysis" component on selected nuclear techniques suitable for providing an introduction to nuclear technology in developing countries.

Outline of changes during 1983–86

H.1.1/7. The programme will be increasingly oriented towards those topics which prove to be of highest importance for nuclear research in developing countries. The results of the work on Mössbauer spectroscopy will be made available for the benefit of Member States.

H.1.1/8. It is planned to start a co-ordinated research programme to encourage the use of the low-energy accelerators and neutron generators that have been introduced into developing countries under the Agency's technical assistance programme for applied studies in the areas of ion implantation, proton-induced X-ray fluorescence, fast-neutron reactor studies and activation analysis.

H.1.1/9. Increased attention will be given to nuclear electronics and computers, in line with expected progress in these areas.

## Utilization of research reactors (component H.1.2)

Objective

H.1.2/1. The objective is to promote the efficient use of research reactors in developing countries, by giving advice and organizing training and co-ordinated research in selected fields, and to study problems related to research reactor core conversion from highly enriched to low-enriched nuclear fuel.

Results to date

H.1.2/2. The latest in a series of symposia on neutron inelastic scattering was held in 1977. An important new aspect was the use of this technique in molecular spectroscopy. Interest in the use of neutron scattering for applied research (mainly metallurgy and chemistry) was emphasized at Advisory Group and consultants' meetings in 1976. The proceedings of these meetings were published in Atomic Energy Review and as an IAEA-TECDOC in 1977. Co-ordinated research programmes on material texture studies by neutron scattering techniques and the non-destructive characterization of nuclear fuel were started in 1978 (Table H.8, Nos. 4 and 10).

H.1.2/3. As a result of an Advisory Group meeting in 1978, a publication on research reactor renewal and upgrading programmes appeared in the IAEA-TECDOC series in 1978 and led to the programme on research reactor core conversion. A comprehensive guidebook on core conversion was completed this year. Missions have been sent to Chile, Greece, Portugal, Turkey and Yugoslavia to advise on the conversion of specific research reactors.

Plans for 1981–82

H.1.2/4. Isotope production with research reactors and the effect of the change to low-enriched nuclear fuel (with special emphasis on short-lived isotopes and on questions of economics) will be considered with the help of an Advisory Group (Table H.9, No.3). Reviews will be made of progress in reactor core conversion, in-core reactor instrumentation and the use of research reactors in safety studies (Table H.9, No.4).

H.1.2/5. The technical missions to advise on core conversion for specific research reactors will be continued.

Outline of changes during 1983–86

H.1.2/6. As a consequence of the research reactor core conversion programme, assistance will be given to Member States with problems related to the administrative requirements for operating research reactors, the training of research reactor operators, the exchange of operating experience and the use of research reactors in safety studies.

## Plasma physics and controlled fusion research (component H.1.3)

Objective

H.1.3/1. The main objective is to assist and promote international co-operation in controlled thermonuclear fusion and in related plasma and nuclear physics programmes and to support the conceptual design and possible subsequent phases of INTOR.

Results to date

H.1.3/2. A scientific secretary has been provided for IFRC since its initiation.

H.1.3/3. In 1978, an INTOR workshop was started with the objective of assessing the scientific and technological basis for construction of the next step in the tokamak approach to a thermonuclear reactor. This objective was met and the report will be issued this year. The Agency has accepted the recommendation of the IFRC that the workshop should continue until July 1981, when a conceptual design schedule will be completed.

H.1.3/4. A co-ordinated research programme over a period of several years joined laboratories in advanced and developing countries in an investigation of materials related to nuclear fusion reactors (Table H.8, No.5); the results have been published in the scientific literature.

H.1.3/5. International conferences and meetings of experts in the field of controlled fusion and plasma physics were held in 1976, 1978 and 1980 to review the progress in research.

Plans for 1981–82

H.1.3/6. The INTOR project will continue with the work on the conceptual design (Table H.9, No.5). In parallel with this, various alternatives for the permanent organization of the INTOR project will be evaluated if a decision is taken to construct the INTOR device.

H.1.3/7. Assistance will be given to the IFRC in carrying out its function of information exchange and national fusion programme co-ordination and in its role in overseeing the INTOR project.

H.1.3/8. The various alternative approaches to fusion reactors will be critically examined with the help of specialists so that international resources can be concentrated on the most promising candidates. This will be done in the areas of heating, confinement and purity control (Table H.9, Nos 6–16).

H.1.3/9. The 9th International Conference on Plasma Physics and Controlled Nuclear Fusion Research will be organized in 1982 (Annex II (13)).

Outline of changes during 1983–86

H.1.3/10. As a result of the expected expansion in national programmes, there may be substantial changes in the Agency's activities. The form these take will depend on the outcome of INTOR.

Co-operation with other organizations

H.1.3/11. The Agency will continue to co-ordinate its activities in nuclear fusion with the International Energy Agency (IEA) through the IFRC, some of whose members represent the IEA.

## SUB-PROGRAMME H.2

### Industrial applications and chemistry

OBJECTIVE

H.2/1. The objective is to promote the transfer of technology relating to industrial applications of isotopes and radiation having the greatest economic and social benefit to developing Member States (with special emphasis on the use of nuclear techniques in the exploitation of natural resources); to assist developing countries by advising on the use of labelled compounds and radiopharmaceuticals; to review, compile and disseminate chemical thermodynamics data on the actinide elements; to advise on the chemical aspects of fusion reactor technology; to assist Member States by ensuring the availability of chemical standards and materials; and to assist them with nuclear analytical methods, including those used for safeguards.

OUTLINE FOR 1981–86

H.2/2. Assistance will be given to developing Member States through the transfer of technology relating to the industrial applications of isotopes and radiation, with special emphasis on the use of nuclear techniques in mineral exploration, mining and processing. A five-year, large-scale UNDP Regional Industrial Demonstration Project is planned for the period 1981–86 and will involve 12 countries in Asia and the Pacific region (RCA). The emphasis will be on technology for non-destructive testing (NDT), tracer technology, radiation processing, nucleonics control systems and nuclear instrument maintenance.

H.2/3. Assistance will be given to developing countries by advising on the availability of stable isotopes, labelled compounds and radiopharmaceuticals and promoting their use through co-ordinated research programmes, training courses and technical assistance projects.

H.2/4. Nuclear analytical methods, including those used for nuclear materials under safeguards, will be reviewed. Assistance will be given to SAL in promoting the availability of chemical standards for safeguards analytical purposes.

H.2/5. Developments in the preparation and use of stable isotopes will be reviewed. Research on synthesis techniques and applications will be supported through a co-ordinated programme.

H.2/6. The series of publications on the chemical thermodynamics of actinide elements and their compounds will be completed.

H.2/7. The chemical aspects of fusion reactor technology will be reviewed.

STRUCTURE

H.2/8. This sub-programme consists of three components, which are described in the following paragraphs.

## Industrial applications and chemistry

### Summary by programme components

Table H.5

| Programme component | Man-years P | Man-years GS | 1981 Cost estimates Staff | Meetings | Contracts | Other | Total |
|---|---|---|---|---|---|---|---|
| Materials testing and analysis | 1.0 | 0.8 | 100 000 | 34 000 | 45 000 | – | 179 000 |
| Production and industrial use of radiation sources | 2.1 | 0.7 | 178 800 | – | 32 000 | 6 200 | 217 000 |
| Chemistry | 2.1 | 0.7 | 181 000 | – | 23 000 | 4 000 | 208 000 |
| Linguistic services | – | – | – | – | – | 11 000 | 11 000 |
| Printing and publishing services | – | – | – | – | – | 114 000 | 114 000 |
| Laboratory services | – | – | – | – | – | 1 746 000 | 1 746 000 |
| Conference services | – | – | – | – | – | 19 000 | 19 000 |
| TOTAL | 5.2 | 2.2 | 459 800 | 34 000 | 100 000 | 1 900 200 | 2 494 000 |

### Materials testing and analysis (component H.2.1)

#### Objective

H.2.1/1. The objective is to promote the use of nuclear techniques in the exploitation of natural resources in developing countries.

#### Results to date

H.2.1/2. The use of nuclear techniques in mineral exploration, mining and processing was reviewed at a symposium in 1977 and a UNDP-funded training course on the subject was held in 1980. A symposium on the application of nuclear methods to the analysis of environmental pollutants was organized in 1976.

H.2.1/3. The practical aspects of energy-dispersive X-ray fluorescence analysis were considered by an Advisory Group in 1978; the results of the meeting were published in 1979.

H.2.1/4. Technical assistance projects aimed at encouraging the use of nucleonic instruments in materials analysis have been implemented this year.

H.2.1/5. A co-ordinated research programme on the use of X-ray and neutron techniques in industrial process control was initiated in 1976 (Table H.8, No.9).

H.2.1/6. The use of NDT methods in developing countries has been encouraged through technical assistance projects. This year, a UNDP demonstration project on NDT was completed in Argentina and an advanced training course given in Singapore.

#### Plans for 1981–82

H.2.1/7. Within the programme of an international conference on industrial applications of radioisotopes and radiation technology, a status review will be made of the economic effects of using nuclear methods in major branches of industry and particularly in mineral exploitation, mining and processing. A training seminar on nuclear analytical methods for mineral exploration, mining and processing will be held in 1982 (Annex II (14)) and a co-ordinated research programme on the subject will be initiated in the same year.

Related activities

H.2.1/8. UNDP-funded training courses on NDT are planned for 1981 and 1982.

Outline of changes during 1983–86

H.2.1/9. A regional co-operative programme on mineral exploitation for countries in Africa is contemplated.

Co-operation with other organizations

H.2.1/10. This component may involve co-operation with UNIDO, ECOSOC's Committee on Natural Resources, other United Nations bodies and various governmental organizations.

Production and industrial use of radiation sources (component H.2.2)

Objective

H.2.2/1. The objective is to arrange for a comprehensive review of the status of the industrial applications of isotopes and radiation; and to encourage research in developing countries on the preparation of isotopes, labelled compounds and radiopharmaceuticals.

Results to date

H.2.2/2. During the past six years, support has been given in 18 developing countries to technical assistance projects aimed at helping them to become self-sufficient in the preparation of a number of isotopes, labelled compounds and radiopharmaceuticals. Five large-scale UNDP projects concerned with radiosterilization and electron beam processing have been carried out. Seven pilot irradiation facilities with cobalt-60 sources have been installed in Member States with the Agency's assistance.

H.2.2/3. Progress in radiation processing was reviewed with the assistance of consultants in 1977 and 1978. A Technical Assistance Expert Mission visited ten countries in Asia and the Pacific region during 1978 to survey present and prospective industrial applications of isotopes and radiation technology. Tracer technology and nuclear analytical methods in environmental studies were discussed at a symposium in 1975 on radiation for a clean environment.

H.2.2/4. A co-ordinated research programme on electron capture gas chromotography was initiated in 1976 (Table H.8, No.11).

H.2.2/5. In 1977, a training course on the preparation, control and utilization of radiopharmaceuticals was organized. A co-ordinated research programme on the preparation of radiopharmaceuticals from accelerator-produced isotopes was initiated in 1975 (Table H.8, No.6) and a preliminary report containing recommendations on future activities issued in 1979.

H.2.2/6. The production and synthesis of labelled compounds and the biological applications of stable isotopes were reviewed by a Technical Committee in 1977.

H.2.2/7. The status of work on the separation of radioisotopes from nuclear wastes was reviewed at a consultants' meeting in 1977. Experience gained with and programmes for the utilization of nuclear centres in Latin America were considered in 1977 and a report issued in the same year setting out recommendations for use by Latin American countries contemplating the establishment of such centres.

H.2.2/8. Reviews of industrial isotope economics were made in 1978 and 1979. The 1979 meeting served also as a planning session for the international conference on industrial applications of radioisotopes and radiation technology to be held in 1981.

Plans for 1981–82

H.2.2/9. Within the programme of the international conference on the industrial applications of radioisotopes and radiation technology, a review will be made of the economic effect of the use of radiation sources in major branches of industry.

H.2.2/10. A co-ordinated research programme will be initiated in 1981 to encourage research in developing countries on the preparation and application of stable isotopes and labelled compounds.

H.2.2/11. With the help of consultants, a review on the application of positron annihilation techniques in chemistry, biology and medicine will be made, with recommendations on future Agency activities in this field (Table H.9, No.17).

H.2.2/12. In 1981, a technical publication will be issued on the status of large radiation sources which appear to be of potential value in industry.

H.2.2/13. Reviews will be made of the production and regulatory aspects of the use of radiopharmaceuticals and of accelerator-produced short-lived radionuclides for medical applications (Table H.9, Nos. 18 and 19).

Related activities

H.2.2/14. A training course on electron beam processing (with emphasis on the processing of polymers and textiles) is planned for 1982.

H.2.2/15. The needs of developing countries will continue to be met through the provision of technical assistance projects.

Outline of changes during 1983–86

H.2.2/16. The large-scale UNDP regional co-operation project on industrial isotope and radiation technology will concentrate on technology transfer and the training of personnel in developing countries in Asia and the Far East.

Co-operation with other organizations

H.2.2/17. This component involves co-operation with national, regional and international organizations, in particular UNDP.

## Chemistry (component H.2.3.)

Objective

H.2.3/1. The objective is to prepare and publish a compilation of thermodynamic data on the actinide elements (1981–82); to advise on the chemical aspects of fusion reactor technology (1981–86); to assist developing countries with the chemistry of stable and radioactive isotopes, including synthesis and quality control procedures (1981–86); and to provide Member States with information on chemical standards and materials (1981–86).

Results to date

H.2.3/2. In 1977 and 1980, Advisory Groups discussed chemical standards for nuclear fuel analyses and safeguards purposes; the results were published in the Journal of the Institute of Nuclear Materials Management and specific recommendations and future actions were identified by the Agency. A series of consultants' meetings have been held in connection with the evaluation of data on the chemical thermodynamics of actinide elements and their compounds. In 1979, a symposium on the thermodynamics of nuclear materials and Advisory Group meetings on oxygen activity changes in oxide fuels and on chemical aspects of fusion technology were held. Actinide separation technology was reviewed at a meeting of consultants in 1979.

H.2.3/3. In 1977, a co-ordinated research programme was started on the thermodynamics and transport properties of nuclear materials (Table H.8, No.3).

Plans for 1981–82

H.2.3/4. Within the framework of a symposium on recent advances in nuclear materials safeguards, a review will be made of nuclear techniques for the analysis of such materials (Annex II (15)).

H.2.3/5. A report will be issued on the availability of stable isotopes and their application in agriculture and biomedicine; recommendations concerning future Agency activities in this area will be made (Table H.9, No.20).

H.2.3/6. A co-ordinated research programme on methods of preparing stable isotopes and their compounds and on their applications will be initiated in 1981.

H.2.3/7. The last of the 14-part series of Agency publications "Chemical Thermodynamics of Actinide Elements and Compounds" will be completed in 1982.

H.2.3/8. A review will be made of the chemical aspects of fusion reactor technology and a report on the subject prepared for IFRC (Table H.9, No.21).

Related activities

H.2.3/9. Training courses on mineral analysis, nuclear analytical techniques and applied radiation chemistry are planned.

H.2.3/10. Research and development work in developing countries will continue to be aided through technical assistance projects.

Outline of changes during 1983–86

H.2.3/11. Assistance will be given to SAL in promoting the availability of chemical standards for safeguards analytical purposes.

Co-operation with other organizations

H.2.3/12. This component involves co-operation with various national bodies (such as the Institute of High Temperatures, Moscow), and with organizations such as CEC, IUPAC, ISO and ICSU (Committee on Data for Science and Technology).

## SUB-PROGRAMME H.3

### Isotope hydrology

OBJECTIVE

H.3/1. The objective is – in line with recommendations made in 1977 at the United Nations Water Conference and in 1979 at the third session of the Intergovernmental Council of UNESCO's International Hydrological Programme – to support the development of isotope techniques for use in water studies, by employing such techniques directly in hydrological investigations of practical interest to Member States and by helping Member States to acquire technical competence or increase their capabilities, and to collect and disseminate basic data and information relating to isotope hydrology.

OUTLINE FOR 1981–86

H.3/2. Activities will be directed towards problems arising in the assessment and development of water resources and towards hydrological problems associated with, for example, site assessments for nuclear power plants and nuclear waste storage facilities.

H.3/3. A seminar on isotope hydrology for hydrologists and hydrogeologists at the managerial level will be organized in 1981 in order to report on recent developments in isotope techniques for hydrology, including their application in geothermal exploration (Annex I (15)).

H.3/4. Within the framework of the fellowship programme, scientists from developing countries will be trained in the Agency's laboratories in the use of isotope techniques for water resources investigations. Lectures will be given by Agency staff members at post-graduate training courses sponsored by UNESCO.

H.3/5. The development and testing of new isotope hydrology methods will be encouraged and supported by means of research contracts.

H.3/6. Agency staff members will participate in some of the working groups established by UNESCO for the second phase of the International Hydrological Programme and will co-operate with the rapporteurs on other subjects selected by UNESCO.

STRUCTURE

H.3/7. This sub-programme (which is closely linked with the "Isotope hydrology" sub-programme of the Agency's Laboratory) consists of four components, which are described in the following paragraphs.

Isotope hydrology

Summary by programme components

Table H.6

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Precipitation | 0.5 | 1.1 | 57 500 | – | 15 000 | 11 500 | 84 000 |
| Surface water | 0.8 | 0.5 | 81 200 | – | 7 000 | 2 800 | 91 000 |
| Groundwater | 2.4 | 1.0 | 183 900 | 11 000 | 25 000 | 7 100 | 227 000 |
| Techniques | 0.5 | 0.6 | 55 000 | 25 000 | 13 000 | 3 000 | 96 000 |
| Costs not directly attributable to specific components | – | – | – | 26 000 | – | – | 26 000 |
| Linguistic services | – | – | – | – | – | 4 000 | 4 000 |
| Printing and publishing services | – | – | – | – | | 114 000 | 114 000 |
| Data processing services | – | – | – | – | – | 17 000 | 17 000 |
| Laboratory services | – | – | – | – | – | 679 000 | 679 000 |
| Conference services | – | – | – | – | – | 26 000 | 26 000 |
| TOTAL | 4.2 | 3.2 | 377 600 | 62 000 | 60 000 | 864 400 | 1 364 000 |

Precipitation (component H.3.1.)

Objective

H.3.1/1. The objective is to measure the tritium, deuterium and oxygen-18 in monthly precipitation samples collected through a world-wide IAEA/WMO network of meteorological stations and to publish the results periodically (1961 – continuing); and to measure the isotopic (and, where necessary, chemical) composition of precipitation samples collected at selected stations of WMO's network for the Global Environmental Monitoring System (GEMS) set up for atmospheric pollution monitoring (1978–82, but may continue).

Results to date

H.3.1/2. The measurements of tritium, deuterium and oxygen-18 in precipitation, most of them performed by the Agency's Isotope Hydrology Laboratory, are published at approximately two-year intervals in the Technical Reports Series. Recent data, as yet unpublished, can be obtained by institutes in Member States as computer print-out. The data are also treated statistically to show the dependence on climatic parameters and to produce long-term mean values.

H.3.1/3. Isotopic data from a number of stations operated by national institutes are also collected and published together with those of the IAEA/WMO network.

Plans for 1981–82

H.3.1/4. Co-operation with WMO for integration (sponsored by UNEP) of the Agency's station network with the GEMS network should become effective. This will mean that some chemical analyses of precipitation samples will be made at the Isotope Hydrology Laboratory, together with interpretation of the isotopic and chemical data.

H.3.1/5. The results of the analyses will be evaluated continuously with regard both to their climatic and meteorological significance and to their usefulness as input data for groundwater and surface water studies. They will be published in the Technical Reports Series.

H.3.1/6. Isotopic studies on precipitation and atmospheric moisture will be supported by means of research contracts.

Related activities

H.3.1/7. Analytical services will be performed by the Agency's Laboratory.

Co-operation with other organizations

H.3.1/8. This component involves co-operation with WMO and UNEP.

Surface water (component H.3.2)

Objective

H.3.2/1. The objective is to encourage, support and evaluate developments in the application of isotope techniques in surface water investigations relating – inter alia – to interrelations between surface water and groundwater, lake dynamics, river discharge, suspended loads and bed sediment transport (1961 – continuing).

Results to date

H.3.2/2. Under sub-contracts from other organizations in the United Nations system, advice and support have been given to studies of the interrelation between surface water and groundwater (in Afghanistan, Argentina, Bangladesh, Ecuador, Greece, Mexico, Paraguay, Sudan and Turkey) and of the water balance and dynamics of Lake Malawi and the Okawango swamps in Botswana. The application of isotope techniques to lake studies was reviewed by an Advisory Group in 1977 and the results were published in 1979.

H.3.2/3. Work has been supported through research contracts on single-borehole techniques for studying leakages in a large reservoir. This involved co-operation with the GSF Institute of Radiohydrometry and the Turkish General Directorate of State Hydraulic Works.

Plans for 1981–82

H.3.2/4. Through the Agency's advisory service and through technical assistance sub-contractual arrangements with other United Nations bodies, support will be given to studies of lakes and of surface water/groundwater relationships by the provision of expertise and analytical facilities.

H.3.2/5. Through the Agency's technical assistance programme, support will also be given to the measurement, using tritium techniques, of river flood discharges. This is a common problem in many developing countries where the rain is concentrated within a short period of time and it is one that cannot be solved by conventional hydrological methods.

H.3.2/6. The use of isotope techniques in evaluating sediment transport in freshwater environments will be reviewed with the help of consultants (Table H.9, No.22) and advice formulated for developing countries where suspended load transport is a recurrent problem during periods of high discharge.

H.3.2/7. Support through the award of research contracts will be given to investigations of various aspects of surface water hydrology, including pollution studies.

Co-operation with other organizations

H.3.2/8. Co-operation will continue with the other United Nations organizations executing the various projects.

## Groundwater (component H.3.3)

Objective

H.3.3/1. The objective is to advise and provide services to Member States regarding the solution of hydrological problems connected with groundwater resources inventories, dynamics and geochemistry (including problems of geothermal exploration) through the use of environmental isotope techniques combined, if necessary, with hydrogeochemical techniques (1961 – continuing); to encourage applications of isotope techniques in assessing the hydrological characteristics of sites selected for waste disposal (1979 – continuing); and to carry out and support research in the evaluation of groundwater recharge with isotope methods.

Results to date

H.3.3/2. Environmental isotope techniques, which often yield results which cannot be obtained by other means, have been used in investigations of the behaviour of water in aquifers to determine the age of groundwater and to trace its movement. As recommended by an Advisory Group in 1975, facilities for the chemical analysis of water have been installed in the Isotope Hydrology Laboratory, so that the combined use of isotopic and hydrochemical methods is now possible.

H.3.3/3. Groundwater field studies, supported through the provision of advice or under the technical assistance programme or sub-contracts from other United Nations bodies, have been carried out or initiated in 19 countries. The work on the interaction between groundwater and surface water has been described above (see para. H.3.2/2).

H.3.3/4. Applications of isotope techniques to arid-zone hydrology were discussed at an Advisory Group meeting in 1978 and a report will be issued in 1980. A review of the use of isotopes in investigating disposal site hydrology was made in 1979.

Plans for 1981–82

H.3.3/5. The studies of various hydrogeological problems in Member States will continue. Under a co-ordinated research programme organized in co-operation with GSF and supported by the Government of the Federal Republic of Germany (1980–82), groundwater recharge will be investigated by isotope techniques, with special emphasis given to quantitative evaluations and to arid-zone recharge.

H.3.3/6. Groundwater studies undertaken in several countries in Asia under RCA will be completed. This part of the programme, financed by the Australian Government, is carried out in co-operation with the Australian Atomic Energy Commission (1979–81).

H.3.3/7. The applicability of isotope techniques to the hydrological investigation of fractured and fissured rocks will be reviewed (Table H.9, No.23).

H.3.3/8. Support will be given through research contracts to investigations of various groundwater problems.

Related activities

H.3.3/9. Consultants will be sent to developing countries to assist in field investigations and to advise on the implementation of isotope hydrology programmes.

Co-operation with other organizations

H.3.3/10. Co-operation in field projects with other United Nations organizations, such as UNDP, FAO, UNESCO and UNICEF is expected to continue.

Techniques (component H.3.4)

Objective

H.3.4/1. The objective is to assist Member States in establishing the analytical capabilities necessary for them to apply isotope techniques in hydrology and geochemistry; and to review and evaluate new applications of isotope techniques in hydrology, recent refinements of such techniques and the application of new methods of data treatment.

Results to date

H.3.4/2. Progress has been made in increasing the possibilities for using isotopic techniques in hydrological studies by developing mathematical models for the treatment of isotopic data; in addition, there have been considerable improvements in the statistical treatment of data. The results have been used in technical assistance projects implemented by the Agency.

H.3.4/3. Progress with tritium determination methods was examined at a consultants meeting held in 1979: an IAEA-TECDOC will be issued this year.

H.3.4/4. The applicability of new isotope methods for dating very old water – which are now being developed – to investigating the hydrology of sites selected for long-term waste storage was discussed at an Advisory Group meeting in 1979 and by consultants in 1980 (report to be issued in 1981).

H.3.4/5. The whole spectrum of isotope tools available for hydrological investigation has been again thoroughly examined by the Working Group on Nuclear Techniques in Hydrology – supported by UNESCO under its International Hydrological Programme – and a new edition of the Guidebook on Nuclear Techniques in Hydrology is under preparation for issue in 1981.

H.3.4/6. Under the Agency's technical assistance programme, a number of countries have received advice and support in the establishment of isotope hydrology laboratories, including Chile, Greece, India (2), Jordan, Mexico, Pakistan and Turkey. Under the RCA isotope hydrology project (see para. H.3.3/6) environmental isotope laboratory facilities have been provided to Indonesia, the Republic of Korea and Thailand.

H.3.4/7. A co-ordinated research programme has been initiated to support technical developments in argon-39 dating and comparison with the carbon-14 method (Table H.8, No.1).

Plans for 1981–82

H.3.4/8. Technical assistance projects in Member States for the establishment of isotope hydrology laboratories will continue.

H.3.4/9. A symposium will be held in 1981 on methods of low-level counting and spectrometry (Annex I (16)).

H.3.4/10. Progress in isotope hydrology will be reviewed in 1982 (Table H.9, No.24).

H.3.4/11. A report on isotope techniques in hydrogeology for nuclear waste disposal will be issued in 1981 after a consultants' meeting this year.

H.3.4/12. Research contracts for the development of particular technical aspects of isotope hydrology will be awarded to institutes in Member States (recently, contracts for this purpose have been awarded to Denmark, New Zealand, Poland and Switzerland).

Related activities

H.3.4/13. Laboratory services will be involved (see "The Laboratory" programme).

## SUB-PROGRAMME H.4

### Nuclear data

OBJECTIVE

H.4/1. The objective is to assess the status of and the need for nuclear and atomic data, to engage in and co-ordinate the compilation, analysis and exchange of nuclear and atomic data, to support the measurement, evaluation and calculation of nuclear and atomic data and to offer cost-free nuclear and atomic data centre services to Member States, especially those which are developing countries.

OUTLINE FOR 1981–86

H.4/2. Data centre services, including the collection and dissemination of neutron and other nuclear reaction data (particularly for developing countries), the co-ordination of measurements and evaluations of required accurate nuclear and atomic data, and the publication of computer-based indexes to nuclear and atomic data references will continue. Emphasis will be placed on providing guidance to scientists from developing countries in the appropriate use of nuclear data in nuclear science and technology programmes and on stimulating and supporting the measurement, evaluation and computation of nuclear data by developing countries. Efforts will be made to achieve an unrestricted international exchange of all evaluated neutron data, and to set up international nuclear data standards in important nuclear technology fields.

H.4/3. Nuclear and atomic data requirements associated with nuclear power programmes and the applications of nuclear methods in Member States will continue to be assessed through scientific meetings, in response to advice by INDC and IFRC. INDC will review this activity in 1981 (Table H.9, No.25).

## CO-OPERATION WITH OTHER ORGANIZATIONS

H.4/4. This sub-programme involves close co-operation with all major regional and national nuclear and atomic data centres (the National Nuclear Data Center, the Nuclear Data Project, the Controlled Fusion Atomic Data Center and the atomic data centres of the National Bureau of Standards in the United States; the nuclear and atomic data centres at Obninsk, Moscow and Leningrad in the Soviet Union; the NEA Data Bank at Saclay in France; and nuclear and atomic data centres in the Federal Republic of Germany, Japan and the United Kingdom). It also involves co-operation with NEA and its Nuclear Data Committee, CEC's Central Bureau for Nuclear Measurements, ICSU's Committee on Data for Science and Technology, and the CEC in the field of atomic and molecular data for fusion.

## STRUCTURE

H.4/5. This sub-programme consists of three components, which are described in the following paragraphs.

### Nuclear data

Summary by programme components

Table H.7

| Programme component | Man-years | | 1981 Cost estimates | | | | |
|---|---|---|---|---|---|---|---|
| | P | GS | Staff | Meetings | Contracts | Other | Total |
| Nuclear reaction data | 9.1 | 6.1 | 730 600 | 23 000 | 29 000 | 19 400 | 802 000 |
| Nuclear structure and decay data | 2.1 | 2.1 | 174 800 | – | 6 000 | 2 200 | 183 000 |
| Atomic and molecular data | 3.1 | 2.1 | 248 700 | – | 26 000 | 4 300 | 279 000 |
| Costs not directly attributable to specific components | – | – | – | 14 000 | – | – | 14 000 |
| Linguistic services | – | – | – | – | – | 68 000 | 68 000 |
| Printing and publishing services | – | – | – | – | – | 187 000 | 187 000 |
| Data processing services | – | – | – | – | – | 113 000 | 113 000 |
| Conference services | – | – | – | – | – | 4 000 | 4 000 |
| TOTAL | 14.3 | 10.3 | 1 154 100 | 37 000 | 61 000 | 397 900 | 1 650 000 |

### Nuclear reaction data (component H.4.1)

Objective

H.4.1/1. The objective is to compile, exchange and disseminate experimental and evaluated neutron, photonuclear and charged-particle nuclear data and make them available upon request to Member States; to co-ordinate the activities of regional data centres; to review the requirements for nuclear reaction data of major importance in nuclear science and technology; and to support and co-ordinate experimental and theoretical research relating to such data (1964 – continuing).

Results to date

H.4.1/2. Since 1975, 585 requests for numerical nuclear data have been received by the Agency. In response to these requests, 98 000 numerical data sets consisting of nearly 20 million individual data records have been made available to nuclear scientists and engineers, primarily in the developing countries.

H.4.1/3. The Computer Index to the Literature on Neutron Data (CINDA) has been published periodically by the Nuclear Data Section since 1970. CINDA is recognized as the basic international index to all measured, calculated and evaluated neutron reaction data. The 1979 issue of this index, CINDA-A, is a cumulative compendium of all indexed neutron data references covering the years 1935–76.

H.4.1/4. Since 1970, results of neutron data measurements have been systematically collected and exchanged between the Nuclear Data Section and three regional neutron data centres by means of the computer-based EXFOR system, which has now been extended to include photo-nuclear and charged-particle nuclear reaction data. Since 1977, neutron and charged-particle nuclear data are being exchanged in the generalized EXFOR format between seven nuclear reaction data centres.

H.4.1/5. Scientific meetings have been held to assess the need for and review the status of nuclear data of importance in various branches of nuclear technology (consultants' meetings on thermal constants of the main fissionable isotopes, delayed-neutron data and neutron source properties and Advisory Groups on fission-product and transactinium isotope nuclear data, nuclear data for fusion and reactor dosimetry data). Since 1975, two issues of the world request list for nuclear data have been published and distributed world-wide to the scientific community. The most recent list, WRENDA 79/80, represents a completely updated version of WRENDA 76/77 and summarizes in a condensed form a total of 1780 requests for specific measurements and evaluations of nuclear data required for fission and fusion reactor technology as well as for nuclear materials safeguards techniques. These lists have been used as the basic background material for decisions relating to the support and co-ordination of nuclear data measurements and evaluations and to the supply of target and sample materials for measurements in developing countries.

H.4.1/6. A co-ordinated research programme on the intercomparison of evaluations of actinide neutron nuclear data was initiated in 1977, with the participation of six developed and three developing countries (Table H.8, No.7). Evaluations produced by the participants are compiled in the IAEA Nuclear Data Library for actinides; this library now contains 15 different evaluated data files.

Plans for 1981–82

H.4.1/7. The expected growth in nuclear power generation, particularly in developing countries, will require an increase in the compilation and dissemination of nuclear data by the Agency. The international nuclear data request list WRENDA will be continuously updated and used to co-ordinate the measurement, computation and evaluation of the required data by a number of laboratories, particularly those from developing countries. In view of the extensive requirements for fast-neutron nuclear data and of the existence of appropriate measurement facilities in 15–20 developing countries (in many cases established with financial support from the Agency), an inter-regional technical assistance project on the measurement, computation and evaluation of fast-neutron nuclear data is planned to start in 1981. With the increase in the number of requests for actinide nuclear data contained in WRENDA 79/80, it is planned to continue the co-ordinated research programme on the intercomparison of evaluations of actinide neutron nuclear data (Table H.8, No.7).

H.4.1/8. The data compilation and exchange activities of the data centres co-operating in the network will continue to be co-ordinated through annual consultants' meetings (Table H.9, No.26).

H.4.1/9. Increased automation and standardization of data processing will make it possible to satisfy the growing nuclear data demand of developing countries with the same manpower as in the preceding two-year period. Guidance will be given to scientists from developing countries in the establishment and use of computerized nuclear data libraries for nuclear reactor design calculations.

H.4.1/10. The manpower released as a result of the creation in 1979–80 of the international reactor dosimetry data file will be used to start a review of the nuclear data required for the analysis of radiation damage (Table H.9, No.27).

H.4.1/11. A detailed review of nuclear data requirements in the biomedical area will be made, with special reference to isotope production and therapy (Table H.9, No.28).

H.4.1/12. Under the guidance of INDC and through work-sharing with the NEA, it will be possible to confine the Agency's review of nuclear data for fission reactor design to a few important parameters for fissile isotopes. The status of resonance parameter data for both the resolved and the unresolved resonance regions of uranium-235, uranium-238, plutonium-239 and plutonium-240 will be reviewed with the aid of consultants in 1981 (Table H.9, No.29). A definitive assessment of the status of the fast standard fission cross-section of uranium-235 (between 0.01 and 15.0 MeV) is to be carried out with the help of consultants the following year (Table H.9, No.30).

Related activities

H.4.1/13. In 1982, a third inter-regional training course on advances in applied nuclear theory and in the evaluation and processing of nuclear data required for nuclear energy development will be organized for scientists from developing countries, in co-operation with the International Centre for Theoretical Physics in Trieste.

H.4.1/14. Support will be provided to enable selected scientists from developing countries to attend the international nuclear data conference planned by NEA in 1981.

Outline of changes during 1983–86

H.4.1/15. Towards the end of this period an international symposium is planned with the objective of assessing the overall status and future perspectives of nuclear data research for the development of fission and fusion nuclear energy.

## Nuclear structure and decay data (component H.4.2)

Objective

H.4.2/1. The objective is to review the requirements for nuclear structure and decay data of importance in the applications of radiation and isotopes; to co-ordinate internationally the compilation, evaluation and dissemination of such data; to promote the measurement and evaluation of required data; and to provide data centre services to users of such data (1972 – continuing).

Results to date

H.4.2/2. Guided by Advisory Group meetings on nuclear structure and decay data held in 1976, 1977 and 1980, an international network of data centres and research groups was established to compile, exchange and disseminate bibliographic and numerical data, to co-ordinate data evaluations and to maintain and update the international Evaluated Nuclear Structure Data File (ENSDF). This is the data base for the periodically updated mass-chain data files published in the "Nuclear Data Sheets" and "Nuclear Physics".

H.4.2/3. In response to a recommendation made in 1975 by an Advisory Group on transactinium isotope nuclear data, a co-ordinated research programme on the measurement and evaluation of transactinium isotope nuclear decay data has been active since 1977 to meet the requirements for nuclear fuel analysis, safeguards applications, mass determination and the preparation and application of radioisotope standards (Table H.8, No.8).

Plans for 1981–82

H.4.2/4. Representatives of the data centres and groups participating in the international network for the compilation, evaluation and publication of nuclear structure and decay data will review the programme of the network in 1982 (Table H.9, No.31). The co-ordinated research programme on the measurement and evaluation of transactinium isotope nuclear decay data will be continued (Table H.8, No.8).

H.4.2/5. On the basis of the ENSDF file and of on-going international data measurement and evaluation programmes, it is planned to develop a comprehensive international file of evaluated half-life and associated decay data (with particular emphasis on nuclear waste isotopes) for standard use in nuclear technology.

## Atomic and molecular data (component H.4.3)

### Objective

H.4.3/1. The objective is to review the requirements for bibliographic and numerical atomic and molecular data in nuclear fusion research and technology and to co-ordinate the compilation, evaluation, publication and dissemination of such data (in co-operation with regional data centres) (1975 – continuing).

### Results to date

H.4.3/2. This activity, which was initiated in 1975 on the recommendation of IFRC, was carried out on a trial basis from 1977 to 1979. It became part of the "Nuclear data" sub-programme in 1980.

H.4.3/3. Expert groups met in 1976, 1977 and 1980 to identify areas exhibiting an urgent need for atomic and molecular data for fusion, to review national programmes in the atomic and molecular data field and to formulate technical recommendations for the Agency's future activities in co-ordinating the worldwide compilation, evaluation and dissemination of these data.

H.4.3/4. The "International Bulletin on Atomic and Molecular Data for Fusion", designed to assist in fusion research and in the development of fusion technology by providing scientists and engineers with an indexed listing of recent references to articles on atomic and molecular data pertinent to fusion and with recently determined and unpublished atomic and molecular data, has been issued quarterly since July 1977.

H.4.3/5. The computerized index to the literature on atomic and molecular collision data relevant to fusion (CIAMDA) was first published in 1980. This index was created by combining five bibliographic data bases from a number of Member States and contains about 13 000 references and over 40 000 indexation lines. The entire preparation of CIAMDA was computer-based, requiring substantial data correction and conversion, including the translation from different input formats into a single common format.

### Plans for 1981–82

H.4.3/6. The publication of the quarterly "International Bulletin on Atomic and Molecular Data for Fusion", dealing with current experimental and theoretical work on fusion-related atomic and molecular data, will continue.

H.4.3/7. The CIAMDA index will continue to be up-dated. A second edition of the index will be issued as determined by demand and the rate of growth of the index file.

H.4.3/8. In co-operation with national and regional atomic and molecular data centres and atomic physics research groups, it is planned to initiate in 1981 a co-ordinated research programme for the measurement and evaluation of the atomic collision and surface interaction data needed for the physics design of currently planned large fusion devices, including INTOR.

H.4.3/9. In co-operation with the network of atomic and molecular data centres and the fusion community, it is planned to create an international file of evaluated atomic and molecular data for dissemination to fusion research laboratories. Consultants' meetings of the members of this network are to be held in 1981 and 1982 (Table H.9, No.32).

## Co-ordinated research programmes

### Table H.8

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Comparison of methods for "age" determination of groundwater based on decay of long-lived radioisotopes | 4 | 1 | 1978 | 1981 |
| 2. Development of methods for the application of Mössbauer spectroscopy in mineralogy, soil sciences and the study of ceramics | 7 | – | 1977 | 1980 |
| 3. Thermodynamic and transport properties of nuclear materials | 1 | 5 | 1977 | 1981 |
| 4. Non-destructive techniques for reactor fuel characterization | 3 | – | 1978 | 1983 |
| 5. Energetic particle interactions with materials of importance for fusion reactors | 7 | 3 | 1975 | 1980 |
| 6. Preparation of radiopharmaceuticals from accelerator-produced isotopes | 3 | 8 | 1975 | 1982 |
| 7. Intercomparison of evaluations of actinide neutron nuclear data | 3 | 7 | 1977 | 1983 |
| 8. Measurement and evaluation of transactinium isotope nuclear decay data | – | 5 | 1977 | 1983 |
| 9. On-line X-ray and neutron techniques for industrial process control | 3 | 4 | 1976 | 1981 |
| 10. Neutron scattering techniques in applied research | 5 | – | 1978 | 1981 |
| 11. Use of electron capture gas chromatography in organic analysis | 2 | 1 | 1976 | 1982 |
| 12. Chemistry and bio-chemistry of radiopharmaceuticals | This programme has been approved but no contract has yet been awarded | | | |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table H.9

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | IAEA-TECDOC on research and teaching of nuclear science at universities in developing countries | Universities, nuclear research planners, technical assistance programme | TC 1981/1 | 1981 | H.1.1/6 |
| 2 | Technical Report on data acquisition systems for nuclear science and technology | Nuclear science laboratories | AG 1982/1 | 1982 | H.1.1/6 |
| 3 | IAEA-TECDOC on isotope production with research reactors | Research reactor centres and Radioisotope users | AG 1981/2 | 1981 | H.1.2/4 |
| 4 | Panel Proceedings Series report on research reactor in-core instrumentation, fuel conversion and safety studies | Research reactor users | TC 1982/2 | 1983 | H.1.2/4 |
| 5 | IAEA-TECDOC on conceptual design for INTOR | As above | TC 1981/3 and 1982/3 | 1982 | H.1.3/6 |
| 6 | Report on status of reverse field heating in toroidal experiments (summary to be submitted to Nuclear Fusion) | IFRC and national fusion programmes | TC 1981/4 | 1981 | H.1.3/8 |
| 7 | Review of results of work on energy confinement times in fusion reactor plasmas (summary to be submitted to Nuclear Fusion) | As above | TC 1981/5 | 1981 | H.1.3/8 |
| 8 | Report on current status of divertor experiments (summary to be submitted to Nuclear Fusion) | As above | TC 1981/6 | 1982 | H.1.3/8 |
| 9 | Report on critical analysis of alternative fusion concepts (summary to be submitted to Nuclear Fusion) | As above | TC 1981/7 | 1982 | H.1.3/8 |
| 10 | Report on prospects for international co-operation on auxiliary heating in tokamaks (summary to be submitted to Nuclear Fusion) | As above | TC 1981/8 | 1982 | H.1.3/8 |
| 11 | Report on operating plans for large tokamak experiments (summary to be submitted to Nuclear Fusion) | As above | TC 1982/4 | 1983 | H.1.3/8 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 12 | Report on status of neutral beam development (summary to be submitted to Nuclear Fusion) | As above | TC 1982/5 | 1983 | H.1.3/8 |
| 13 | Report on status of inertial confinement experiments (summary to be submitted to Nuclear Fusion) | As above | TC 1982/6 | 1983 | H.1.3/8 |
| 14 | Report on status of large, open confinement systems (summary to be submitted to Nuclear Fusion) | As above | TC 1982/7 | 1983 | H.1.3/8 |
| 15 | Report on research into environmental effects of fusion reactors (summary to be submitted to Nuclear Fusion) | As above | TC 1982/8 | 1983 | H.1.3/8 |
| 16 | Review of numerical simulation in plasma theory (summary to be submitted to Nuclear Fusion) | As above | TC 1982/9 | 1983 | H.1.3/8 |
| 17 | Report on the application of positron annihilation techniques to chemistry, biology and medicine, with recommendations for future Agency activities | Laboratories in developing countries and Agency Secretariat | Consultants' meeting in 1982 | 1982 | H.2.2/11 |
| 18 | IAEA-TECDOC on production and regulatory aspects of the utilization of radiopharmaceuticals | Laboratories in developing countries | TC 1982/10 | 1983 | H.2.2/13 |
| 19 | IAEA-TECDOC with recommendations on future Agency programme in accelerator-produced radiopharmaceuticals | Agency Secretariat | AG 1982/11 | 1982 | H.2.2/13 |
| 20 | Technical Report on status of stable isotope availability and applications, with recommendations for future Agency activities | Laboratories in developing countries and Agency Secretariat | AG 1982/12 | 1982 | H.2.3/5 |
| 21 | Report to IFRC on chemical aspects of fusion reactor technology | IFRC and fusion laboratories | AG 1982/13 | 1982 | H.2.3/8 |
| 22 | IAEA-TECDOC on development of radioisotope techniques for sediment transport studies | Laboratories in developing countries | Consultants' meeting in 1982 | 1983 | H.3.2/6 |
| 23 | Technical Report on isotope techniques for hydrological investigations of fractured and fissured rocks | Laboratories and institutes of isotope hydrology, hydrologists, hydrogeologists and geochemists | AG 1981/9 | 1982 | H.3.3/7 |
| 24 | Technical Report on new methods in isotope hydrology | Laboratories and institutes of isotope hydrology, hydrologists, hydrogeologists, hydraulic engineers, geochemists and geophysicists | AG 1982/14 | 1983 | H.3.4/10 |

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 25 | Official minutes of the INDC meeting (INDC report series) | INDC, nuclear data community and Agency Secretariat | TC 1981/10 | 1982 | H.4/3 |
| 26 | Reports on co-ordination for the compilation, exchange and dissemination of nuclear reaction data (INDC report series) | All data centres and groups participating in the nuclear reaction data centre network and Agency Secretariat | Consultants' meetings in 1981 and 1982 | 1982<br>1983 | H.4.1/8 |
| 27 | IAEA-TECDOC on the requirements and availability of nuclear data for the analysis of radiation damage | Nuclear physicists and engineers, metallurgists and Agency Secretariat | AG 1981/11 | 1981 | H.4.1/10 |
| 28 | IAEA-TECDOC on the requirements and availabilty of nuclear data in the biomedical field, with emphasis on isotope production and therapy | Biomedical and nuclear medical professions, isotope production (accelerator) scientists and Agency Secretariat | AG 1982/15 | 1983 | H.4.1/11 |
| 29 | Status report on neutron resonance data for the major fissile isotopes (INDC report series) | Neutron physics and reactor physics communities, other nuclear data centres and Agency Secretariat | Consultants' meeting in 1981 | 1981 | H.4.1/12 |
| 30 | Status report on the fast fission cross-section of U-235 (INDC report series) | As above | Consultants' meeting in 1982 | 1982 | H.4.1/12 |
| 31 | Report on the compilation, evaluation and dissemination of nuclear structure and decay data (NSDD) (INDC report series) | All data centres and groups participating in the NSDD network and Agency Secretariat | AG 1982/16 | 1982 | H.4.2/4 |
| 32 | Reports on the compilation, evaluation and exchange of atomic and molecular (A+M) data for fusion (INDC report series) | All data centres and groups participating in the A+M data network, atomic physics and fusion research community and Agency Secretariat | Consultants' meetings in 1981 and 1982 | 1981<br>1982 | H.4.3/9 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Technical Committee on research in and teaching of nuclear sciences at universities in developing countries | H.1.1/6 |
| 2. | Advisory Group on isotope production with research reactors | H.1.2/4 |
| 3. | International Tokamak Reactor Workshop | H.1.3/6 |
| 4. | Technical Committee on reverse field heating in toroidal experiments | H.1.3/8 |
| 5. | Technical Committee on energy confinement times in fusion reactor plasmas | H.1.3/8 |
| 6. | Technical Committee on divertor experiments | H.1.3/8 |
| 7. | Technical Committee on critical analysis of alternative fusion concepts | H.1.3/8 |
| 8. | Technical Committee on international co-operation on auxiliary heating in tokamaks | H.1.3/8 |
| 9. | Advisory Group on isotope techniques for hydrological investigation of fractured and fissured rocks | H.3.3/7 |
| 10. | Twelfth Meeting of International Nuclear Data Committee | H.4/3 |
| 11. | Advisory Group on nuclear data for radiation damage | H.4.1/10 |
| 1982 | | |
| 1. | Advisory Group on data acquisition systems in nuclear science and technology | H.1.1/6 |
| 2. | Technical Committee on research reactor in-core instrumentation, fuel conversion and safety codes | H.1.2/4 |
| 3. | International Tokamak Reactor Workshop | H.1.3/6 |
| 4. | Technical Committee on operating plans for large tokamak experiments | H.1.3/8 |
| 5. | Technical Committee on neutral beam system development | H.1.3/8 |
| 6. | Technical Committee on inertial confinement experiments | H.1.3/8 |
| 7. | Technical Committee on large open confinement experiments | H.1.3/8 |
| 8. | Technical Committee on environmental effects of fusion reactors | H.1.3/8 |
| 9. | Technical Committee on numerical simulation in plasma theory | H.1.3/8 |
| 10. | Technical Committee on quality control and regulatory problems in the preparation and utilization of radiopharmaceuticals | H.2.2/13 |
| 11. | Advisory Group on accelerator-produced short-lived radionuclides for medical applications | H.2.2/13 |
| 12. | Advisory Group on stable isotope availability and applications | H.2.3/5 |
| 13. | Advisory Group on chemical aspects of fusion reactor technology | H.2.3/8 |
| 14. | Advisory Group on new methods in isotope hydrology | H.3.4/10 |
| 15. | Advisory Group on biomedical nuclear data | H.4.1/11 |
| 16. | Meeting of the Nuclear Structure and Decay Data Network | H.4.2/4 |

# I. THE LABORATORY

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table I.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 435 311 | 2 846 000 | 183 000 | (13 000) | 170 000 | 3 016 000 | 3 196 000 | 3 408 000 |
| Overtime | 10 558 | 12 300 | 200 | (9 700) | (9 500) | 2 800 | 10 000 | 12 000 |
| Temporary assistance | 12 385 | 24 200 | 1 000 | (6 400) | (5 400) | 18 800 | 23 000 | 24 000 |
| Sub-total | 2 458 254 | 2 882 500 | 184 200 | (29 100) | 155 100 | 3 037 600 | 3 229 000 | 3 444 000 |
| Common staff costs | 743 382 | 825 400 | 98 100 | (4 000) | 94 100 | 919 500 | 991 000 | 1 056 000 |
| Travel | 7 228 | 12 800 | 1 900 | (2 300) | (400) | 12 400 | 18 000 | 20 000 |
| Scientific and technical contracts | 12 777 | 15 000 | 1 000 | (3 000) | (2 000) | 13 000 | 15 000 | 17 000 |
| Scientific supplies and equipment | 316 311 | 339 000 | 34 000 | (10 000) | 24 000 | 363 000 | 419 000 | 407 000 |
| Common services, supplies and equipment | 952 994 | 1 376 700 | 126 300 | (269 000) | (142 700) | 1 234 000 | 1 276 000 | 1 318 000 |
| Other items of expenditure | 1 989 | 14 600 | 1 500 | (8 600) | (7 100) | 7 500 | 10 000 | 12 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 17 710 | 10 000 | 1 000 | 5 000 | 6 000 | 16 000 | 17 000 | 18 000 |
| Printing and publishing services | 15 318 | 20 000 | 2 000 | 9 000 | 11 000 | 31 000 | 29 000 | 31 000 |
| Data processing services | 25 379 | 26 000 | (1 000) | (5 000) | (6 000) | 20 000 | 40 000 | 50 000 |
| Laboratory services | (4 551 342) | (5 522 000) | (449 000) | 317 000 | (132 000) | (5 654 000) | (6 044 000) | (6 373 000) |
| TOTAL | – | – | – | – | – | – | – | – |

## SUMMARY OF MANPOWER

Table I.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | – | – | – | – | – | – | – |
| P-5 | 3 | 3 | 4 | – | 4 | 4 | 4 |
| P-4 | 12 | 12 | 11 | – | 11 | 11 | 11 |
| P-3 | 6 | 6 | 6 | – | 6 | 6 | 6 |
| P-2 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| P-1 | 2 | 2 | 1 | – | 1 | 1 | 1 |
| Sub-total | 26 | 26 | 25 | – | 25 | 25 | 25 |
| GS | 60 | 60 | 60 | – | 60 | 60 | 60 |
| M&O | 25 | 25 | 27 | – | 27 | 27 | 27 |
| TOTAL | 111 | 111 | 112 | – | 112 | 112 | 112 |

## CHANGES IN COSTS AND MANPOWER

### Costs

I/1. As will be seen from Table I.1 above, the cost of the Laboratory's services is allocated to the programmes for which they are provided. The total cost of these services is expected to increase by $132 000 as a net result of salary and other price increases of $449 000 partly offset by a programme decrease of $317 000.

I/2. The programme decrease of $17 000 in respect of salaries and common staff costs is the net result of several transfers of posts which have been made in the adjusted manning table for 1980 in order to accommodate the needs of the Agency's programme, as explained in Annex IV. Further programme decreases are foreseen in respect of overtime ($9 700), temporary assistance ($6 400), travel ($2 300), scientific and technical contracts ($3 000) and scientific supplies and equipment ($10 000). Also, it is hoped that a programme decrease of $269 000 can be achieved in respect of common services, supplies and equipment. The programme reduction of $8 600 under "Other items of expenditure" is related to staff training.

I/3. As regards the allocation of service costs, the programme increases foreseen in respect of linguistic services ($5 000) and printing and publishing services ($9 000) are partly offset by a programme decrease in respect of data processing services ($5 000).

I/4. It is expected that income from the provision of laboratory services will amount to $100 000 in 1981.

### Manpower

I/5. As will be seen from Table I.2 above, several changes have been made in the adjusted manning table for 1980. One P-4 post and one P-1 post have been exchanged for a P-5 post and a GS post from the Monaco Laboratory in order to provide for the required grading structure; two M&O posts have been transferred from another programme to the Laboratory; and one GS post no longer required for metrology work was transferred to another programme. Details are provided in Annex IV.

I/6. No further manpower changes are foreseen for 1981, 1982 and 1983.

## Summary of manpower and costs by laboratory sub-programmes

Table I.3

| Sub-programme | 1981 Estimate | | | | 1982 Preliminary estimate | | | | 1983 Preliminary estimate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Man-years P | Man-years GS | Man-years M&O | Costs | Man-years P | Man-years GS | Man-years M&O | Costs | Man-years P | Man-years GS | Man-years M&O | Costs |
| Chemistry | | | | | | | | | | | | |
| Quality control of radiochemical analysis | 1.8 | 3.7 | 1.8 | 410 000 | 1.8 | 3.7 | 1.8 | 417 000 | 1.8 | 3.7 | 1.8 | 439 000 |
| Support in analytical chemistry to Member States, other units within the Agency and other United Nations organizations | 1.0 | 4.2 | 1.8 | 306 000 | 1.0 | 4.2 | 1.8 | 306 000 | 1.0 | 4.2 | 1.8 | 323 000 |
| Support in chemistry to the Agriculture Section of the Laboratory | 0.4 | 1.5 | 0.7 | 60 000 | 0.4 | 1.5 | 0.7 | 63 000 | 0.4 | 1.5 | 0.7 | 66 000 |
| Sub-total | 3.2 | 9.4 | 4.3 | 776 000 | 3.2 | 9.4 | 4.3 | 786 000 | 3.2 | 9.4 | 4.3 | 828 000 |
| Isotope hydrology | | | | | | | | | | | | |
| Analytical services in support of the "Isotope hydrology" sub-programme of the "Physical Sciences" programme | 2.9 | 7.2 | – | 480 000 | 2.9 | 7.2 | – | 515 000 | 2.9 | 7.2 | – | 543 000 |
| Preparation and distribution of standards and intercalibration of measurements | 1.2 | 2.5 | – | 199 000 | 1.2 | 2.5 | – | 210 000 | 1.2 | 2.5 | – | 222 000 |
| Sub-total | 4.1 | 9.7 | – | 679 000 | 4.1 | 9.7 | – | 725 000 | 4.1 | 9.7 | – | 765 000 |
| Medical applications | 2.1 | 5.6 | 1.0 | 577 000 | 2.1 | 5.6 | 1.0 | 604 000 | 2.1 | 5.6 | 1.0 | 637 000 |
| Agriculture | | | | | | | | | | | | |
| Services to the "Soil fertility, irrigation and crop production" sub-programme of the "Food and Agriculture" programme | 2.2 | 2.6 | 3.2 | 343 000 | 2.2 | 2.6 | 3.2 | 392 000 | 2.2 | 2.6 | 3.2 | 413 000 |
| Services to the "Plant breeding and genetics" sub-programme of the "Food and Agriculture" programme | 2.2 | 2.4 | 3.2 | 303 000 | 2.2 | 2.4 | 3.2 | 334 000 | 2.2 | 2.4 | 3.2 | 352 000 |
| Services to the "Insect and pest control" sub-programme of the "Food and Agriculture" programme | 3.9 | 5.4 | 5.2 | 644 000 | 3.9 | 5.4 | 5.2 | 725 000 | 3.9 | 5.4 | 5.2 | 765 000 |
| Sub-total | 8.3 | 10.4 | 11.6 | 1 290 000 | 8.3 | 10.4 | 11.6 | 1 451 000 | 8.3 | 10.4 | 11.6 | 1 530 000 |
| Safeguards Analytical Laboratory (SAL) | | | | | | | | | | | | |
| Analytical and other support for safeguards activities | 4.5 | 8.2 | 4.0 | 1 066 000 | 4.5 | 8.2 | 4.0 | 1 109 000 | 4.5 | 8.2 | 4.0 | 1 188 000 |
| Analytical services in support of other Agency activities | 0.5 | 2.8 | 1.0 | 420 000 | 0.5 | 2.8 | 1.0 | 462 000 | 0.5 | 2.8 | 1.0 | 469 000 |
| Sub-total | 5.0 | 11.0 | 5.0 | 1 486 000 | 5.0 | 11.0 | 5.0 | 1 571 000 | 5.0 | 11.0 | 5.0 | 1 657 000 |
| Electronics and measurements services | | | | | | | | | | | | |
| For the general laboratory | 1.8 | 12.8 | 4.8 | 746 000 | 1.8 | 12.8 | 4.8 | 802 000 | 1.8 | 12.8 | 4.8 | 846 000 |
| For the Department of Safeguards | 0.5 | 1.1 | 0.3 | 100 000 | 0.5 | 1.1 | 0.3 | 105 000 | 0.5 | 1.1 | 0.3 | 110 000 |
| Sub-total | 2.3 | 13.9 | 5.1 | 846 000 | 2.3 | 13.9 | 5.1 | 907 000 | 2.3 | 13.9 | 5.1 | 956 000 |
| TOTAL | 25.0 | 60.0 | 27.0 | 5 654 000 | 25.0 | 60.0 | 27.0 | 6 044 000 | 25.0 | 60.0 | 27.0 | 6 373 000 |

## THE PROGRAMME

### OBJECTIVE

I/7. The objective is to support (through such activities as the provision of analytical services, the calibration of radionuclides and the development of techniques) the Agency's regular technical programmes (including safeguards) and its technical assistance programme.

### STRUCTURE

I/8. This programme consists of six sub-programmes, which are dealt with separately below.

*(see Table I.3)*

Laboratory services: Breakdown of costs by programme

Table I.4

| | 1979 Actual obligations | 1980 Adjusted budget | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|
| Food and agriculture | 1 174 029 | 1 381 000 | 1 386 000 | 1 520 000 | 1 605 000 |
| Life sciences | 707 668 | 675 000 | 677 000 | 730 000 | 770 000 |
| Physical sciences | 2 068 585 | 2 388 000 | 2 425 000 | 2 580 000 | 2 700 000 |
| Safeguards | 601 060 | 1 078 000 | 1 166 000 | 1 214 000 | 1 298 000 |
| TOTAL | 4 551 342 | 5 522 000 | 5 654 000 | 6 044 000 | 6 373 000 |

## Apportionment of total laboratory costs to relevant sub-programmes

Table I.5

| Sub-programme | 1981 Estimate | | | | 1982 Preliminary estimate | | | | 1983 Preliminary estimate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | | Costs | Man-years | | | Costs | Man-years | | | Costs |
| | P | GS | M&O | | P | GS | M&O | | P | GS | M&O | |
| Food and agriculture | | | | | | | | | | | | |
| Soil fertility, irrigation and crop production | 2.2 | 2.6 | 3.2 | 333 000 | 2.2 | 2.6 | 3.2 | 365 000 | 2.2 | 2.6 | 3.2 | 385 000 |
| Plant breeding and genetics | 2.2 | 2.4 | 3.2 | 347 000 | 2.2 | 2.4 | 3.2 | 380 000 | 2.2 | 2.4 | 3.2 | 400 000 |
| Insect and pest control | 4.6 | 7.0 | 6.2 | 706 000 | 4.6 | 7.0 | 6.2 | 775 000 | 4.6 | 7.0 | 6.2 | 820 000 |
| Sub-total | 9.0 | 12.0 | 12.6 | 1 386 000 | 9.0 | 12.0 | 12.6 | 1 520 000 | 9.0 | 12.0 | 12.6 | 1 605 000 |
| Life sciences | | | | | | | | | | | | |
| Medical applications | 2.3 | 6.7 | 1.3 | 440 000 | 2.3 | 6.7 | 1.3 | 475 000 | 2.3 | 6.7 | 1.3 | 495 000 |
| Dosimetry for intentional radiation exposures [a] | – | – | – | 237 000 | – | – | – | 255 000 | – | – | – | 275 000 |
| Sub-total | 2.3 | 6.7 | 1.3 | 677 000 | 2.3 | 6.7 | 1.3 | 730 000 | 2.3 | 6.7 | 1.3 | 770 000 |
| Physical sciences | | | | | | | | | | | | |
| Industrial applications and chemistry | 4.3 | 20.4 | 8.3 | 1 746 000 | 4.3 | 20.4 | 8.3 | 1 850 000 | 4.3 | 20.4 | 8.3 | 1 940 000 |
| Isotope hydrology | 4.4 | 11.6 | 0.5 | 679 000 | 4.4 | 11.6 | 0.5 | 730 000 | 4.4 | 11.6 | 0.5 | 760 000 |
| Sub-total | 8.7 | 32.0 | 8.8 | 2 425 000 | 8.7 | 32.0 | 8.8 | 2 580 000 | 8.7 | 32.0 | 8.8 | 2 700 000 |
| Safeguards | 5.0 | 9.3 | 4.3 | 1 166 000 | 5.0 | 9.3 | 4.3 | 1 214 000 | 5.0 | 9.3 | 4.3 | 1 298 000 |
| TOTAL | 25.0 | 60.0 | 27.0 | 5 654 000 | 25.0 | 60.0 | 27.0 | 6 044 000 | 25.0 | 60.0 | 27.0 | 6 373 000 |

[a] Staff included in Life sciences programme.

## SUB-PROGRAMME I.1

### Electronics and measurements

### OBJECTIVE

I.1/1. The objective is to provide electronics and workshop facilities and to carry out radioactivity measurements as required.

### RESULTS TO DATE

I.1/2. In March 1980, the former "Nuclear metrology" sub-programme was amalgamated with "Electronics and workshop services for Agency scientific and technical projects". The external activities originally under the former component have ceased except for the intercomparison of calibrated radioisotopes by means of stable ionization chambers, which is a long-term commitment but one which constitutes a small part of the workload.

I.1/3. In addition to the servicing and maintenance of electronic equipment, special attention has been given, in collaboration with the Division of Life Sciences, to the development of prototypes of inexpensive automatic nuclear equipment suitable for hospital use in developing countries (simple to operate and service and protected against mains variation or breakdown). In 1979, two microprocessor based models of the control electronics for an automatic scintillation counter measuring system were developed. In addition, surveillance equipment has been constructed or modified for the Department of Safeguards.

I.1/4. Calibrated radioactive sources have been prepared for various sections of the Laboratory, for the Safeguards Department, for health and safety programmes and for technical assistance projects. A soil surface moisture meter developed for the "Agriculture" sub-programme has shown promising results.

I.1/5. Two intercomparisons of the data processing of Ge(Li) gamma spectra have been carried out in collaboration with the Division of Life Sciences to establish the best computer code for unfolding gamma-spectra and to compare measurement procedures (aliquoting, source preparation, equipment reproducibility, data processing and absolute calibration) used at different laboratories. The results were presented at a conference in Puerto Rico in 1978.

I.1/6. The intercomparison of calibrated radionuclide solutions from different Member States by means of very stable ionization chambers has continued. Forty-six samples were measured in 1977, fifty-six in 1978 and thirty in 1979.

I.1/7. The SAND II neutron unfolding code has been used successfully for the standardization of reactor radiation measurements (neutron spectra, total neutron flux and neutron fluence). Other unfolding codes (for example, Crystal Ball and Windows) have also been tried and compared.

I.1/8. The effect of the thickness of an indium foil detector on specific activation rates for the 1.456 ev resonance have been determined to show the statistical and systematic errors of the measurement arrangements. Other activation reactions have also been investigated. Volumes I and II of the "Compilation of Neutron Flux Density Spectra and Reaction Rates in Different Neutron Fields" were published by 1979.

### PLANS FOR 1981–86

I.1/9. Services will be provided to other sections of the Laboratory and to other parts of the Agency in electronics, maintenance and design (of non-commercially available equipment) and in radioactive measurement and source preparation, within the limits of staff and equipment available.

I.1/10. Work for the Division of Safeguards, especially with respect to the testing and calibration of their surveillance equipment, will continue.

I.1/11. Development work on the soil surface moisture meter will be completed in 1981.

I.1/12. Microprocessor based measurement systems will be introduced.

# SUB-PROGRAMME I.2

## Chemistry

### OBJECTIVE

I.2/1. The objective is to advise and assist Member States, other units within the Agency and other United Nations organizations in matters relating to chemistry, particularly analytical chemistry and radiochemistry.

### STRUCTURE

I.2/2. This sub-programme consists of three components, which are described in the following paragraphs.

#### Quality control of radiochemical analysis (component I.2.1)

Objective

I.2.1/1. The objective is to assist laboratories in Member States to achieve and maintain a high level of reliability in analytical work relevant to areas of nuclear science and technology by organizing and evaluating analytical intercomparisons and providing certified reference materials and reference materials (1964-continuing).

Results to date

I.2.1/2. During the period 1975–79, analytical intercomparisons were organized at a rate of between four and eight a year, with an average of 30–40 laboratories participating in each intercomparison. In addition, standard and reference samples were supplied to check the validity of analytical procedures used in uranium prospecting, nuclear and isotope measurements, reactor technology, safeguards, radioactive waste disposal and environmental isotope work, geology and hydrology. This involved contacts with 1600 laboratories in 61 Member States and, in 1978 and 1979, the shipment of 279 samples for intercomparison purposes and of 1108 aliquots of certified reference or reference materials. Again, reports on various aspects of this work, particularly on the production and certification of new reference materials were published in scientific journals and internal reports and in papers presented at technical or scientific meetings.

Plans for 1981–82

I.2.1/3. In 1981 a review will be made with the aid of consultants of the future development of this programme component (Table I.6, No.1). The last review of this type was made in 1973. Areas which might receive increased attention are trace element geology and pollution management. While the number of intercomparisons is expected to continue at the 1979 level, work on the production and certification of additional reference materials will be increased since this activity has been shown to be more cost-effective.

Outline of changes during 1983–86

I.2.1/4. In line with accepted policy, the production of any material which becomes available from other sources in sufficient quantity and adequate quality will be phased out.

Co-operation with other organizations

I.2.1/5. Contacts have been established and will be maintained with WMO, WHO, FAO, UNEP, the International Bureau of Weights and Measures, the Reference Materials Commission of ISO, IUPAC, the International Organization of Legal Metrology, the International Commission on Radionuclide Metrology, the International Working Group on Geological Reference Materials and national laboratories engaged in the production and certification of reference materials.

## Support in analytical chemistry to Member States, other units within the Agency and other United Nations organizations (component I.2.2)

### Objective

I.2.2/1. The objective is to provide the analytical support required in the execution of Agency or Agency-administered programmes such as technical assistance and UNDP programmes on uranium exploration, including the analysis of samples, the organization or servicing of training courses, in-service training, technical assistance projects and short missions to Member States and the provision of technical advice (1962-continuing).

### Results to date

I.2.2/2. During 1978–79, 2900 determinations of uranium, thorium and some other elements were performed on 1090 samples (mainly rock, soils or sediments) received from projects in 19 countries. Two hundred and fifty urine samples received from safeguards inspectors were analysed for plutonium-239 and a few urine and fecal samples were analysed for americium-241.

I.2.2/3. During the last few years, assistance in the form of the measurement of samples has been augmented by direct assistance to certain Member States in setting up their own analytical facilities (Columbia, Madagascar, Uruguay and Zambia).

I.2.2/4. On-the-job training has continued (three fellows in uranium analysis and one in low-level radiochemical analysis in 1978 and 1979).

### Plans for 1981–82

I.2.2/5. It is expected that 500–1000 samples a year will have to be analysed in support of uranium prospecting associated with technical assistance projects. The need for plutonium-239 monitoring is expected to increase.

I.2.2/6. Advisory missions will continue to be undertaken as requested. Laboratories in Member States will be assisted to become self-reliant in prospection and related uranium and thorium analysis, partly with the aid of equipment provided through technical assistance programmes and UNDP.

I.2.2/7. A training course in uranium ore analysis is planned for 1981. This might involve assistance in the form of lecturing and laboratory work.

### Outline of changes during 1983–86

I.2.2/8. The number of laboratories capable of dealing with the analysis of uranium prospection samples will increase and this will change the nature of the assistance needed from the analysis of routine samples to the provision of certified reference materials and the carrying out of intercalibration work.

## Support in chemistry to the Agriculture Section of the Laboratory (component I.2.3)

### Objective

I.2.3/1. To provide support to the Agriculture Section, specifically in mass and emission spectroscopy and analytical chemistry (1962-continuing).

Results to date

I.2.3/2. Advice and assistance with analytical chemistry have been provided as required (1370 amino acid determinations in 1979).

Plans for 1981–82

I.2.3/3. Assistance will continue to be provided at approximately the same level.

## SUB-PROGRAMME I.3

### Isotope hydrology

STRUCTURE

I.3/1. This sub-programme consists of two components, which are described in the following paragraphs.

#### Analytical services in support of the "Isotope hydrology" sub-programme of the "Physical Sciences" programme (component I.3.1)

Objective

I.3.1/1. The objective is to provide analytical services in support of the "Isotope hydrology" sub-programme of the "Physical Sciences" programme.

Results to date

I.3.1/2. During the period 1975–79, about 11 000 oxygen-18, 10 000 deuterium, 3500 tritium and 100 carbon-14 analyses were performed for the Agency/WMO "Isotopes in Precipitation" survey and for field projects in Member States. In the same period, about 400 chemical analyses of natural water have been performed as a complement to isotopic analyses.

I.3.1/3. Several Member States have received help in setting up their own analytical facilities – advice on equipment, testing and calibration of equipment after installation and training of scientists and technicians in the use of equipment.

Plans for 1981–86

I.3.1/4. The activities of the Isotope Hydrology Laboratory will continue after its move to the permanent Headquarters in VIC (involving about 4000 stable-isotope, 500 tritium and 50 carbon-14 determinations per year). Measurement techniques will be further developed and the use of automation and computer techniques in data handling will be increased.

I.3.1/5. The Laboratory will continue to provide services for the co-ordinated research programme on groundwater dating methods and other possible future international projects.

Related activities

I.3.1/6. Laboratories are being installed in Bulgaria and Turkey under a technical assistance project.

Preparation and distribution of standards and intercalibration of measurements (component I.3.2)

Objective

I.3.2/1. The objective is to prepare standards for the intercalibration of measurements and distribute them among laboratories working in isotope hydrology and geochemistry.

Results to date

I.3.2/2. Standard water samples with known stable-isotope composition have been distributed by the Isotope Hydrology Laboratory to laboratories in Member States.

I.3.2/3. Low-level tritium measurement techniques, the problem of tritium standards and the half-life of tritium were discussed by a consultants' meeting in 1979.

Plans for 1981–86

I.3.2/4. Distribution will continue on request of standard water samples with known stable-isotope composition, including samples conforming to the standards newly established (expected average of 25 sets of samples per year). The results of the current intercalibration will be evaluated.

I.3.2/5. Standard tritium-free water will be prepared and distributed to laboratories in accordance with the recommendations by the 1979 consultants' meeting.

I.3.2/6. Advisory services to laboratories in Member States, mainly in developing countries will continue in the form of the cross-checking of calibration standards (about five cases per year), and assistance in elaborating and establishing analytical procedures.

I.3.2/7. An inter-laboratory comparison of environmental tritium measurements (involving some 80 laboratories) will be organized in 1985.

## SUB-PROGRAMME I.4

### Medical applications

OBJECTIVE

I.4/1. The objective is to provide laboratory services in support of the "Medical applications" sub-programme of the "Life Sciences" programme and to assist other units of the Agency and other United Nations organizations in matters relating to the medical applications of radionuclides and nuclear techniques.

PLANS FOR 1981–86

I.4/2. The main activities will be the provision of support to the Agency's technical assistance and research contract programmes, and the joint research programmes with WHO, and the provision of analytical quality control services for medical applications of nuclear techniques in Member States.

I.4/3. This sub-programme consists of three components, which are described in the following paragraphs.

## Instrumentation for nuclear medicine in developing countries (component I.4.1)

### Objective

I.4.1/1. The objective is to develop and adapt instrumentation for the measurement of radionuclides, with special reference to the needs of nuclear medicine units in developing countries (1977–82) and to assist the implementation of improved strategies for maintenance and repair of nuclear medicine instrumentation (1980–85).

### Results to date

I.4.1/2. Five prototype automatic well scintillation counters, intended mainly for radioimmunoassay and combining low cost and other features intended to make them of maximum use in developing countries, have been designed and constructed. Three of these have been supplied under research contracts and technical assistance to laboratories in developing countries and a fourth was supplied to an established laboratory in a developed country for field testing; further instruments are being manufactured by a commercial firm. These instruments incorporate appropriate hardware and software to provide sophisticated data evaluation by methods that ensure analytical quality control. A prototype power-conditioning device, intended to reduce the effects of unreliable AC mains power, has been designed. Market surveys of various kinds of commercially available nuclear medicine instrumentation have been completed and published.

### Plans for 1981–82

I.4.1/3. Studies will continue on specific instruments or instrument components in an attempt to introduce improvements which would be of particular relevance to operation in developing countries. Current attention focuses on devices for reducing the effect of power supply variations and the adaptation of simple calculators and domestic computers, together with their software, for use in conjunction with radiation measurements. Compilations of commercially available well scintillation counter systems will continue to be made.

I.4.1/4. Support will be rendered by laboratory staff to co-ordinated research programme and possible technical assistance projects established in South East Asia, Latin America and Africa for the purpose of upgrading instrument maintenance. This will take the form of administering these projects, testing or adapting instruments and providing training.

### Related activities

I.4.1/5. This programme component provides support for the component of the same name in the "Medical applications" sub-programme of the "Life Sciences" programme.

## Activation analysis of elements of biomedical significance (component I.4.2)

### Objective

I.4.2/1. The objective is to intercompare and assist in improving activation analysis techniques as applied, in collaboration with WHO, to research projects on trace elements in foodstuffs, particularly human milk (1976–82), mineral elements in the epidemiology of ischaemic heart disease (1980–81), and selected problems in occupational health (1980–83); and, in response to requests from laboratories in Member States, to supply analytical quality control materials, to prepare new analytical reference materials, and to develop and apply procedures for use in interlaboratory comparisons (quality control).

### Results to date

I.4.2/2. Services have been provided for two co-ordinated research programmes, both of which are supported by WHO. The Laboratory has supplied precleaned collection vessels of various kinds to the 12 participants in these pro-

grammes together with up to 5 different analytical quality control materials, some of which have been prepared and tested especially for this purpose. The laboratory also continues to serve as a receiving and distributing centre for samples collected under these programmes, i.e. receiving samples from the collecting centres (~ 250 per year) and aliquoting and distributing them to the participating analytical laboratories. Some analyses have also been carried out. A computerized file of analytical results and autopsy data for the cardiovascular diseases programme has been established and currently contains about 10 000 records.

I.4.2/3. Analytical quality control materials of various kinds have been prepared for distribution to interested laboratories in Member States, principally a powdered animal-muscle reference standard for trace element studies (approximately 100 recipients) and a reference service has been established (in conjunction with the Electronics and Measurements Section) on the evaluation of Ge(Li) gamma-ray spectra (approximately 200 recipients). Reports on these activities have been published this year.

Plans for 1981–82

I.4.2/4. Special emphasis will be given to the joint research programme with WHO on trace elements in human milk (which involves the determination of 24 minor and trace elements in about 500 samples). The laboratory will act as a reference centre and as a receiving and distributing centre for this study and will also undertake some of the analyses itself.

I.4.2/5. It is planned to complete the preparation of a certified animal bone reference material. A considerable demand exists for this material, but technical difficulties have so far prevented its preparation on a sufficiently large scale.

I.4.2/6. The laboratory will also assist in the work on the "Health-related environmental research" sub-programme of the "Life Sciences" programme, through the provision of the necessary laboratory facilities.

Outline of changes during 1983–86

I.4.2/7. A new project on the modifying role of trace elements in relation to environmental carcinogens may be started during this period in collaboration with the International Agency for Research on Cancer (IARC).

Co-operation with other organizations

I.4.2/8. The Medical Applications Laboratory already serves as a reference centre for WHO for mineral and trace element studies in human nutrition. Collaboration of this kind is expected to continue, possibly also with other United Nations organizations such as IARC. Collaboration will also be maintained with other standardizing institutions such as the United States National Bureau of Standards.

## Whole-body counting (component I.4.3)

Objective

I.4.3/1. The objective is to monitor Agency staff members (laboratory personnel and safeguards inspectors) for possible radioactive contamination.

Results to date

I.4.3/2. The whole-body counter has continued to be used for routine contamination monitoring of Agency staff members for internal deposits of radioactivity. Approximately 250–300 such measurements are performed each year for gamma-ray emitters (e.g. fission products) or for emitters of low-energy X rays (in particular plutonium). Structural improvements are to be introduced this year to facilitate the change-over between gamma-ray and X-ray counting modes.

Plans for 1981–82

I.4.3/3. A continued need for whole-body counting is foreseen. It is planned to link the counter to an existing minicomputer to allow a major improvement in data processing.

## SUB-PROGRAMME I.5

### Agriculture

STRUCTURE

I.5/1. The sub-programme consists of four components, which are described in the following paragraphs.

#### Services to the "Soil fertility, irrigation and crop production" sub-programme of the "Food and Agriculture" programme (component I.5.1)

Objective

I.5.1/1. To provide training, to perform routine isotopic analyses, to prepare and distribute labelled fertilizers (1962-continuing) and to develop techniques for following the fate of fertilizer and symbiotically-fixed nitrogen in soil-plant systems (1977–83).

Results to date

I.5.1/2. Analytical services have been provided for studies of efficient nitrogen and phosphorus fertilizer use and symbiotic nitrogen fixation by legume crops. About 10 000–15 000 samples have been analysed each year.

I.5.1/3. A new mass spectrometer was installed to carry out routine services for the analysis of nitrogen-15 in samples which have an enrichment of this isotope close to natural abundance.

I.5.1/4. The techniques for the determination of symbiotic nitrogen fixation have been greatly improved, especially in relation to the use of standards, the fertilizer application methods, the sample preparation, the nitrogen-15 analyses and the reduction of experimental errors by appropriate statistical lay-out and design.

I.5.1/5. With the support of SIDA, two 7-week international training courses on the use of isotope techniques in fertilizer efficiency studies were organized in 1978 and 1979 (20 participants in each course). At present, there are always between two and four fellows being trained for periods varying from 3 months to 2 years in the use of isotopes for crop mutation studies.

Plans for 1981–82

I.5.1/6. Routine analysis for nitrogen-15 in plant samples provided by contractors under the biological nitrogen fixation co-ordinated research programme of the "Food and Agriculture" programme. Scientists supported by the fellowship programme will participate in associated laboratory, greenhouse and field work. Soil moisture and density equipment for field measurements in the surface 0–25 cm layers will be further developed and tested; gas chromatographic methods for the determination of gaseous nitrogen losses in conjunction with emission spectrometric methods for the determination of nitrogen-15 will be developed in co-operation with the Electronics and Measurements Section.

I.5.1/7. In 1981 and 1982, two SIDA supported training courses on the use of isotopes in fertilizer efficiency research will be organized for 14 participants from developing countries.

## Services to the "Plant breeding and genetics" sub-programme of the "Food and Agriculture" programme (component I.5.2)

### Objective

I.5.2/1. The objective is to provide seed and plant material irradiation services for co-ordinated research programmes (1965-continuing), to develop methods for and provide training in mutation induction (1965-continuing), to carry out routine screening of crops for mutants with improved and/or increased grain protein (1970–82) and to develop methods for the efficient use of mutagens in breeding for improved yield and quality in grain legumes (1974–84) and industrial crops (1980–90).

### Results to date

I.5.2/2. Considerable emphasis has been placed on the development of analytical methods for the selection of protein mutants of wheat, barley, rice and millet. Total protein and the amounts of certain amino acids in seed material are being determined at a rate of 800 samples per day by means of semi-automatic and fully automatic methods.

I.5.2/3. Methodological studies of the efficiency of the induction of mutational changes for protein improvement in wheat have led to the conclusion that such changes occur with an appreciably lower frequency in this cereal than in diploid species (barley or rice for example). Mutant lines in wheat with improved seed protein content have been identified and will be made available to Member States in 1980.

I.5.2/4. In view of the increasing world-wide interest in grain legume improvement, investigations of the response of legume seed species to various mutagens have been started; suitable dose ranges determined for certain species have been announced in the "Mutation Breeding Newsletter".

### Plans for 1981–82

I.5.2/5. The provision of seed irradiation and analytical services, the development of analytical procedures and the provision of training in the field of mutation induction and utilization will continue. Subject to the availability of funds, the training component will increase.

I.5.2/6. Research projects connected with the FAO/IAEA/GSF/SIDA seed protein improvement programme are likely to be terminated and the volume of analytical services will gradually decrease.

I.5.2/7. The carrying out of research and the provision of training and services in the area of mutation induction and breeding for grain legumes and industrial crops will be intensified in order to support co-ordinated research programmes of the Joint FAO/IAEA Division.

### Outline of changes during 1983–86

I.5.2/8. Increased emphasis will be placed on the provision of advisory services and training in areas of special interest for plant breeding in developing countries.

## Services to the "Insect and pest control" sub-programme of the "Food and Agriculture" programme (component I.5.3)

### Objective

I.5.3/1. The objective is to develop techniques for and provide training in the mass-rearing and release methodology of the Mediterranean fruit fly (1968–81) and other plant-feeding insects (1968–83) and of the tsetse fly (1970–85); to develop radioisotope methods for the study of the ecology (1978–83) (dispersal, longevity, host plant interactions and so on) of plant feeding insects and tsetse flies; and to develop, with the help of isotope techniques, more predictable and effective insecticide application methods (1978–84).

Results to date

I.5.3/2. The development of mass-rearing methods for Mediterranean fruit flies (medflies) and tsetse flies has continued. The emphasis in rearing medflies is on the development of more efficient diets using ingredients locally available at the site of the field programmes. The emphasis with the tsetse fly rearing is on the use of artificial feeding membranes with freeze-dried animal blood as food. Currently, Glossina palpalis, G. morsitans, G. tachinoides and G. pallidipes are being reared on freeze-dried blood. Membranes developed at the Laboratory are being supplied for experimental use to Member States. Freeze-dried blood is being supplied to the Nigerian programme.

I.5.3/3. The results of the mass-rearing technology developed at the Laboratory have been transferred to programmes of Member States; in the case of the medfly to the large mass-rearing facility in Metapa (Mexico) and for tsetse flies to the mass-rearing facility of BICOT in Vom (Nigeria). These facilities are expected to play a leading role in the application of the sterile-insect-technique and in the provision of training.

Plans for 1981–82

I.5.3/4. Techniques developed in mass-rearing will be transferred to establishments in Member States. The provision of training in the mass-rearing and irradiation of medflies will continue through 1981.

I.5.3/5. The Mexican project is expected to reach full capacity by the end of 1981. According to arrangements with the Mexican authorities, expertise achieved with the Agency's assistance will be made available to other Member States wishing to apply the sterile-insect-technique (SIT) for medfly control. The laboratory research in this area will be phased out at Seibersdorf by the end of 1981.

I.5.3/6. Similar training with tsetse flies will continue in support of new and on-going programmes.

I.5.3/7. A large BICOT programme in Nigeria will be supported with flies, expertise, training and freeze-dried blood. The tsetse fly colonies in Nigeria are expected to reach a capacity adequate for a large-scale SIT programme by the end of 1981 (about 250 000 breeding female flies). The Seibersdorf Laboratory will provide a back-up colony of 40 000 to 50 000 flies of the target species. It will provide mass-rearing research to enable the BICOT programme to attack two or more species of tsetse flies simultaneously.

I.5.3/8. Methods will continue to be developed for assessing and comparing the quality of mass-reared and wild insects; training will also be provided.

I.5.3/9. Isotope tagging and tracer methods will be developed for and used in ecological and physiological studies with tsetse flies and plant-feeding insects.

## SUB-PROGRAMME I.6

### Safeguards Analytical Laboratory (SAL)

STRUCTURE

I.6/1. This sub-programme consists of two components, which are described in the following paragraphs.

#### Analytical and other support for safeguards activities (component I.6.1)

Objective

I.6.1/1. The objective is to carry out chemical and isotopic analyses of safeguards samples and provide training in analytical techniques; to participate in safeguards analytical quality control work; to assist in the characterization of safeguards physical standards and in the modification, maintenance and calibration of non-destructive assay and other inspection equipment; and to assist in the training of safeguards inspectors.

Results to date

I.6.1/2. Since July 1979, SAL has held a full "type A" license for the operation of its programme. All safeguards inspection samples since that time have been received and handled in SAL for analysis or redistribution. Analyses of 540 samples were performed in 1979 (in 183 cases isotope dilution analysis was used). This represents about 60% of the overall man-power capacity of the laboratory but a full load for the mass-spectrometry group. The analysis of spent fuel samples by the resin bead technique has been demonstrated. A uranium automatic titrator has been put into routine operation.

I.6.1/3. The analysis of safeguards samples has remained the principal activity in support of safeguards, but assistance for safeguards work has also been given with non-destructive testing and the development of surveillance techniques.

Plans for 1981–82

I.6.1/4. It is planned to purchase a new mass spectrometer to provide higher precision and back-up in case of failure of the existing two stage instrument. Facility-specific procedures will be developed and tested to implement the resin bead technique. The sensitivity of the titration and coulometry of plutonium will be increased without loss of accuracy thus permitting a reduction in the sample size and therefore in the problem of shipping samples of plutonium products. Reliable procedures to obtain small but representative samples of solid plutonium materials will be tested. Improvements in sample and information flow will be made to reduce reporting delays. The use of computerized analytical sample management and report preparation will be introduced. Spectrographic analysis techniques for plutonium samples will be tested and implemented with the installation of a glove box equipped with a muffle furnace. A Ge(Li) well detector will be installed for the determination of the uranium-235 abundance in safeguard samples. For the measurement of the plutonium content in waste drums, a drum scanner will be installed and tested.

Outline of changes during 1983–86

I.6.1/5. It is expected that during this period the point will be reached where optimum use is being made of SAL's capacity in different fields, with direct support for safeguards and other Agency activities accounting for 80–90% of the time and the maintenance of analytical equipment and the development and improvement of techniques accounting for 10–20%.

## Analytical services in support of other Agency activities (component I.6.2)

Objective

I.6.2/1. The objective is to assist – to the extent that SAL's manpower is not being utilized for safeguards work – with activities under the "Analytical quality control" component of the Laboratory's "Chemistry" sub-programme and to provide analytical services to other units within the Agency.

Results to date

I.6.2/2. In 1978 and 1979, trace element analyses were performed on 144 samples of human head hair under the "Life Sciences" programme. The installation of a "clean laboratory" for the handling of relevant samples has been initiated. Uranium dioxide control samples have been prepared for the "Analytical quality control" component of the Laboratory's "Chemistry" sub-programme.

Plans for 1981–82

I.6.2/3. A "clean laboratory" will be installed, analytical methods will be developed, analytical services continued and evaluation of results carried out.

I.6.2/4. The need for and the possibility of establishing an international system of measurements on nuclear materials relating to the fuel cycle will be studied.

Outline of changes during 1983–86

I.6.2/5. Depending on the outcome of the study, activities in connection with the international measurement system may be expanded.

SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

TABLE I.6

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | Recommendations to Director General on the future programme on quality control of radiochemical analysis | Agency Secretariat | Consultants' meeting in 1981 | 1981 | I.2.1/3 |

# J. INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table J.1

| Item of expenditure | 1979 Actual obligations Regular budget | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Other items of expenditure | 550 000 | 741 000 | 47 000 | (12 000) | 35 000 | 776 000 | 840 000 | 907 000 |
| Printing and publishing services | 27 763 | 160 000 | 18 000 | 12 000 | 30 000 | 190 000 | 190 000 | 190 000 |
| TOTAL | 577 763 | 901 000 | 65 000 | – | 65 000 | 966 000 | 1 030 000 | 1 097 000 |

## SUMMARY OF MANPOWER

Table J.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| P-5 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-4 | 2 | 2 | 2 | – | 2 | 2 | 2 |
| P-3 | 2 | 2 | 2 | – | 2 | 2 | 2 |
| Sub-total | 5 | 5 | 5 | – | 5 | 5 | 5 |
| GS | 17 | 17 | 17 | – | 17 | 17 | 17 |
| TOTAL | 22 | 22 | 22 | – | 22 | 22 | 22 |

## CHANGES IN COSTS

J/1. Table J.1 above shows the Regular Budget contribution towards the financing of the Trieste Centre. It consists of a basic contribution and of a contribution to meet publishing costs. It is expected that the cost of the programme under the Regular Budget will increase by $65 000, which will be required to cover price increases.

J/2. The total costs of the programme are presented in Annex V. Details of extrabudgetary resources will be found in Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–1981).

## THE PROGRAMME

### OBJECTIVE

J/3. The objective is to foster, through research and training for research, the advancement of physics and – to a lesser extent – work in applicable mathematics, with special regard to the needs of developing countries so as to encourage scientists from those countries to continue and expand their research work.

### CO-OPERATION WITH OTHER ORGANIZATIONS

J/4. The Centre is operated jointly by the Agency and UNESCO and is supported by the Italian Government; the Swedish Government, through SIDA and SAREC, has participated in its financing. UNDP has financed projects in the physics of oceans and the atmosphere, in applied mathematics and computer science, and in solid state physics, with UNESCO as executing agency. Discussions regarding further financing by SAREC and by UNDP are still in progress.

J/5. It is expected that other United Nations specialized agencies will co-operate in areas within their spheres of interest.

## RELATED ACTIVITIES

J/6. As a follow-up to activities at the Centre, and in order to give more researchers from developing countries an opportunity to discuss problems in their own environment, support has been given to a number of meetings in developing countries, the main ones being the conferences on physics and contemporary needs held in Pakistan every year since 1976; these conferences were supported largely by the Government of Pakistan (the one held in 1976 also received considerable support from SIDA) and were attended by over 100 scientists each year. In 1979, the Centre supported scientific symposia in Dacca (Bangladesh), Surat (India), and Bogota (Colombia); the intention is to continue providing support for selected meetings in developing countries.

J/7. The Centre has given support for a conference on solar energy held in Waterloo, Canada, and a course on physics teaching held in Grenoble, France, both with a large participation by scientists from the developing countries.

## OUTLINE FOR 1981–86

J/8. The plans described below cover in general only the period 1981–82. During the period 1983–86, there will be somewhat more emphasis on those areas of physics which are of greatest relevance to energy problems.

## STRUCTURE

J/9. This programme, formulated in the light of advice given by the Centre's Scientific Council and by various advisory committees, consists of six sub-programmes, which are dealt with separately below.

# SUB-PROGRAMME J.1

## Physics and technology

### OBJECTIVE

J.1/1. The objective is to foster fundamental research and training for fundamental research in condensed matter physics and in atomic, molecular and laser physics in developing countries, with emphasis on aspects leading to applications in industrial and technological development.

### STRUCTURE

J.1/2. This sub-programme consists of two components, which are described in the following paragraphs.

#### Condensed matter physics (including semiconductor devices, superconductors, surface phenomena and modern materials) (component J.1.1)

Results to date

J.1.1/1. This component was initiated in 1967. Extended courses were held in 1976 and 1978 and workshops lasting three to four months have been organized every year since 1975; topical meetings have been held in various years within the framework of the workshops. A course (to be followed by a workshop) on the physics of polymers, liquid crystals and low-dimensional solids has been planned for 1980. To date, about 1500 scientists have participated in these activities. Approximately 235 preprints and the proceedings of the extended courses have been published.

Plans for 1981 – 1982

J.1.1/2. It is planned to organize a workshop on condensed matter physics in 1981 and a spring college on condensed matter physics and material science followed by a workshop on condensed matter physics in 1982.

Atomic, molecular and laser physics (component J.1.2)

Results to date

J.1.2/1. The Centre has organized three winter colleges on atoms, molecules and lasers (in 1973 and 1977) and one on atomic, molecular and laser physics and quantum optics (1979). They were attended by a total of 287 lecturers and other participants.

Plans for 1981 – 82

J.1.2/2. Topics in atomic, molecular and laser physics will be discussed at a winter college in 1981.

## SUB-PROGRAMME J.2

### Physics and energy

OBJECTIVE

J.2/1. The objective is to foster research and training for research in theoretical nuclear physics and nuclear reactor theory and in the physics of nuclear fusion and of renewable energy sources such as solar energy, with particular reference to the needs of developing countries.

STRUCTURE

J.2/2. This sub-programme consists of three components, which are described in the following paragraphs.

Nuclear physics (component J.2.1)

Results to date

J.2.1/1. This component was initiated in 1964 with a small research group. An extended course was organized in 1979. Workshops and topical meetings were organized in 1975, 1976 and 1978. In the years when there was no formal programme of work in nuclear physics, some research was carried out by associate members, independently or in collaboration with scientific staff of the University of Trieste. Some 1500 scientists have participated in these activities. A course and workshops on nuclear theory and nuclear reactors have been planned for 1980. Proceedings of the extended courses and of various topical meetings have been published.

Plans for 1981 – 82

J.2.1/2. A workshop (including a topical meeting) on nuclear and reactor physics is planned for 1981 and a further extended seminar will be held in 1982.

Plasma physics and nuclear fusion (component J.2.2)

Results to date

J.2.2/1. This component was initiated in 1964. A research session was organized in 1978 and a topical meeting in 1975. In 1977, the Centre organized a three-week seminar on theoretical and computational plasma physics, during which the Third International (Kiev) Conference on Plasma Theory was held, and hosted a meeting of the International Fusion Research Council. An autumn course on plasma physics took place in 1979.

J.2.2/2. Excellent collaboration between participating plasma physicists has characterized the research sessions. In recent years there has been a marked increase in the participation of scientists from developing countries.

Plans for 1981–82

J.2.2/3. An extended course or workshop on plasma physics will be organized in 1981.

Solar energy and other energy sources (component J.2.3)

Results to date

J.2.3/1. In 1977 and 1979 the Centre organized, in collaboration with the International College of Applied Physics, courses on solar energy and non-conventional energy respectively; they were attended by a total of 383 lecturers and other participants. In 1978 a meeting (followed by an extended seminar) on thermal energy storage was held in French, mainly for the benefit of French-speaking African scientists; 157 participants attended.

Plans for 1981–82

J.2.3/2. It is planned to organize a summer college on non-conventional energy sources in 1981. Also, the Centre will support outside activities.

## SUB-PROGRAMME J.3

### Physics and the frontiers of knowledge

OBJECTIVE

J.3/1. The objective is to provide a forum for international collaboration at the highest possible level in the most advanced research in fundamental theoretical physics and to enable university teachers from developing countries, through participation in meetings held at the Centre, to bring their knowledge up to date and exchange ideas concerning their research work.

STRUCTURE

J.3/2. This sub-programme consists of three components, described in the following paragraphs.

High-energy and particle physics (component J.3.1)

Results to date

J.3.1/1. This component was initiated in 1964. One topical meeting was held in 1975, four in 1976, two in 1977 and one in 1978. In 1979 there was a summer workshop on theoretical physics and for November of this year a topical meeting on confinement in field theory has been planned. Research in high-energy physics has been carried out continuously at the Centre since its establishment. About 3000 physicists have participated in this part of the programme as visiting or guest scientists, associate members, fellows, guest lecturers and seminar participants. Over a thousand preprints and the proceedings of the seminar held in 1965 and of various other meetings have been published.

Plans for 1981–82

J.3.1/2. Topical meetings on high-energy physics will be held in both years. Research will continue and one or more meetings relating to current developments will be held if the need arises.

Relativity, cosmology and astrophysics (component J.3.2)

Results to date

J.3.2/1. A conference on high-resolution spectronomy was held in 1978 and an international workshop on image processing in astronomy, organized by the University of Trieste, was held on the Centre's premises in 1979. A meeting on recent developments in the fundamentals of general relativity took place in 1975 and one on physics and astrophysics aspects of the Spacelab programme in 1976; total participation in these two meetings was 208. A second Marcel Grossmann meeting was organized in 1979, with the participation of 370 scientists.

Plans for 1981–82

J.3.2/2. It is planned to organize summer research sessions and/or topical meetings, possibly in both years. The size of the research groups will depend on the resources available.

Biophysics (component J.3.3)

Plans for 1981–86

J.3.3/1. Subject to the availability of funds, small meetings will be held in some years during this period.

## SUB-PROGRAMME J.4

### Applicable mathematics and planning models

OBJECTIVE

J.4/1. The objective is to acquaint scientists with applications of and new methods for using mathematical tools in the various disciplines in which activities are conducted at the Centre through, for example, projects financed by UNDP and executed by UNESCO.

STRUCTURE

J.4/2. This sub-programme consists of two components, which are described in the following paragraphs.

Applicable mathematics (component J.4/1)

Results to date

J.4.1/1. An extended seminar on fluid dynamics and its applications to other branches of science was held in 1976 and an extended course on applications of complex analysis in 1975; a workshop on problems of boundary values for ordinary differential equations and of their applications took place in 1977. A study group on solitons, partial differential equations and spectral methods met in July 1979, bringing together some 40 scientists. A workshop on recent advances in the theory of evolution equations was held in November 1979.

Plans for 1981–82

J.4.1/2. The subject of applicable mathematics will be covered at meetings which also deal with systems analysis (see para. J.4.2/2 below).

Systems analysis, computing and the mathematics of development (component J.4.2)

Results to date

J.4.2/1. A course on systems analysis and one on mathematical economics took place in 1978, with a total participation of 196 scientists.

Plans for 1981–82

J.4.2/2. A workshop on applicable mathematics and systems analysis will be held in 1981 and a further extended seminar is being planned for 1982.

## SUB-PROGRAMME J.5

### Physics of natural resources and the environment

OBJECTIVE

J.5/1. The objective is to foster, in developing countries, research and training for research (both fundamental and applied) in fields relating to natural resources, with emphasis on their preservation and on pollution problems, and to bring the specialized knowledge and skills of physicists, mathematicians and biologists to bear on particular problems.

RESULTS TO DATE

J.5/2. The Centre organized a three-month course on the physics of oceans and the atmosphere in 1975; it was attended by 123 scientists. A ten-week course on the physics of the earth, including an advisory meeting and seminar on earthquake prediction, was held in 1977, with the participation of some 110 scientists. Plans have been made for an autumn course this year on the physics of flow in oceans, the atmosphere and deserts.

PLANS FOR 1981–82

J.5/3. A further autumn course on geophysics and related topics will be organized in 1982, possibly with the co-operation of other international organizations.

## SUB-PROGRAMME J.6

### Physics teaching

OBJECTIVE

J.6/1. The objective is – under UNESCO's auspices – to impart to scientists with teaching duties in developing countries modern teaching methods which take local social, economic and cultural conditions into account, thereby promoting and improving the teaching of physics at all levels, particularly in Member States where scientific communities are still very small.

RESULTS TO DATE

J.6/2. A workshop was organized in 1976 for scientists from English-speaking developing countries and one in 1977 for scientists from French-speaking developing countries; the number of participants was 50 and 83 respectively. In 1979, the Centre supported a course in Grenoble, France, similar to the 1977 workshop.

PLANS FOR 1981–82

J.6/3. It is planned to hold workshops and seminars in both years, subject to the availability of funds.

## WORKSHOPS AND OTHER MEETINGS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Workshop on condensed matter physics | J.1.1/2 |
| 2. | Winter college on atomic, molecular and laser physics | J.1.2/2 |
| 3. | Workshop on nuclear and reactor physics | J.2.1/2 |
| 4. | Autumn college on plasma physics | J.2.2/3 |
| 5. | Summer college on non-conventional energy sources | J.2.3/2 |
| 6. | Topical meeting on high-energy physics | J.3.1/2 |
| 7. | Workshop on applicable mathematics and systems analysis | J.4.2/2 |

| 1982 | | |
|---|---|---|
| 1. | Spring college on condensed matter physics and material science | J.1.1/2 |
| 2. | Workshop on condensed matter physics | J.1.1/2 |
| 3. | Winter college on nuclear and reactor physics | J.2.1/2 |
| 4. | Topical meeting on high-energy physics | J.3.1/2 |
| 5. | Autumn college on applicable mathematics and systems analysis | J.4.2/2 |
| 6. | Autumn course on geophysics | J.5/3 |

# K. INTERNATIONAL LABORATORY OF MARINE RADIOACTIVITY

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table K.1

| Item of expenditure | 1979 Actual obligations Regular budget | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 510 763 | 650 000 | 30 000 | – | 30 000 | 680 000 | 729 000 | 762 000 |
| Consultants | 8 533 | 6 500 | 500 | – | 500 | 7 000 | 8 000 | 9 000 |
| Overtime | 468 | – | – | – | – | – | – | – |
| Sub-total | 519 764 | 656 500 | 30 500 | – | 30 500 | 687 000 | 737 000 | 771 000 |
| Common staff costs | 155 911 | 188 900 | 18 400 | – | 18 400 | 207 300 | 226 200 | 236 100 |
| Travel | 4 678 | 10 000 | 1 500 | (500) | 1 000 | 11 000 | 12 000 | 13 000 |
| Representation and hospitality | 859 | 1 600 | 100 | – | 100 | 1 700 | 1 800 | 1 900 |
| Scientific supplies and equipment | 22 444 | 40 000 | 4 000 | – | 4 000 | 44 000 | 60 000 | 55 000 |
| Common services, supplies and equipment | 8 702 | 15 000 | 2 000 | – | 2 000 | 17 000 | 40 000 | 45 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 136 | 1 000 | – | – | – | 1 000 | 1 000 | 1 000 |
| Printing and publishing services | 104 | 2 000 | 200 | (200) | – | 2 000 | 2 000 | 3 000 |
| TOTAL | 712 598 | 915 000 | 56 700 | (700) | 56 000 | 971 000 | 1 080 000 | 1 126 000 |

## SUMMARY OF MANPOWER

Table K.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| P-5 | 3 | 3 | 2 | – | 2 | 2 | 2 |
| P-4 | 2 | 2 | 3 | – | 3 | 3 | 3 |
| P-3 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-1 | 2 | 2 | 3 | – | 3 | 3 | 3 |
| Sub-total | 8 | 8 | 9 | – | 9 | 9 | 9 |
| GS | 15 | 15 | 14 | – | 14 | 15 | 15 |
| TOTAL | 23 | 23 | 23 | – | 23 | 24 | 24 |

## CHANGES IN COSTS AND MANPOWER

### Costs

K/1. As will be seen from Table K.1 above, the cost of this programme under the Regular Budget is expected to increase by $56 000 as a net result of salary and other price increases of $56 700 and a programme decrease of $700 in respect of duty travel and printing services.

K/2. As can be seen from Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–1981), the contribution from the Monegasque Government is expected to be $120 000. Also, it is expected that UNEP will support environmental protection activities by contributing $135 000 and that UNESCO will contribute $8 000.

### Manpower

K/3. As will be seen from the "1980 Adjusted" column of Table K.2 above, one P-5 post and one GS post have been transferred to another programme in exchange for one P-4 post and one P-1 post. No further changes are foreseen for 1981. It is expected that for 1982 one additional GS post will be required.

## Summary of manpower and costs by sub-programme

Table K.3

| Sub-programme | 1981 Estimate | | | | | 1982 Preliminary estimate | | | | | 1983 Preliminary estimate | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Man-years | | Costs | | | Man-years | | Costs | | | Man-years | | Costs | | |
| | P | GS | Staff | Other | Total | P | GS | Staff | Other | Total | P | GS | Staff | Other | Total |
| Marine biology | 2.5 | 5.0 | 284 200 | 27 800 | 312 000 | 2.5 | 5.0 | 300 000 | 37 000 | 337 000 | 2.5 | 5.0 | 316 000 | 38 000 | 354 000 |
| Marine chemistry | 3.5 | 4.0 | 295 000 | 25 000 | 320 000 | 3.5 | 4.5 | 324 800 | 41 200 | 366 000 | 3.5 | 4.5 | 339 300 | 41 700 | 381 000 |
| Marine geochemistry | 3.0 | 5.0 | 315 100 | 23 900 | 339 000 | 3.0 | 5.5 | 338 400 | 38 600 | 377 000 | 3.0 | 5.5 | 351 800 | 39 200 | 391 000 |
| TOTAL | 9.0 | 14.0 | 894 300 | 76 700 | 971 000 | 9.0 | 15.0 | 963 200 | 116 800 | 1 080 000 | 9.0 | 15.0 | 1 007 100 | 118 900 | 1 126 000 |

## THE PROGRAMME

### OBJECTIVE

K/4. The objective is:

(i) to study the occurrence and behaviour of radioactive substances and other forms of pollution in the marine environment;

(ii) to ensure the quality and comparability of studies of radioactive substances and other forms of pollution in the marine environment carried out by national laboratories through inter-laboratory comparisons, calibration and standardization of methodology; and

(iii) to assist Member States by training personnel, establishing co-ordinated research programmes and providing advice and assistance.

### STRUCTURE

K/5. This programme consists of three sub-programmes, which are dealt with separately below.

*(see Table K.3)*

## SUB-PROGRAMME K.1.

Marine biology

### OBJECTIVE

K.1/1. The objective is to assess the role of biological processes in the transport, transfer and behaviour of radionuclides, trace metals and other pollutants in the marine environment.

### RESULTS TO DATE

K.1/2. Relatively high concentrations of various radionuclides, trace elements and organochlorine compounds have been found in biogenic detritus collected in situ. The data, coupled with biomass and sinking rate estimates, show clearly the quantitative importance of biological processes in removing these contaminants from the surface layers and transporting them to depth. Radiotracer experiments with a variety of marine organisms indicate that water and food are more important than sediments as transfer vectors for transuranic elements. The natural alpha-emitter polonium-210 has been found to concentrate to extremely high levels in certain tissues of marine organisms. Also, polonium-210 measurements have indicated the potential usefulness of this radionuclide as a natural tracer for various processes in marine biological systems.

K.1/3. Radiotracer studies of heavy metals have shown that environmental parameters such as temperature, salinity and food supply can profoundly affect the cycling of these contaminants through marine biota. Recently completed baseline surveys of trace metals and chlorinated hydrocarbons indicate that levels of these contaminants in pelagic species from the open Mediterranean are generally similar to those measured in similar organisms from other oceanic regions.

### PLANS FOR 1981–82

K.1/4. Studies will be initiated on the transport, metabolism and fate of transuranic elements, $^{210}$Po-$^{210}$Pb and technetium in marine organisms. Emphasis will be placed on assessing the behaviour of these radionuclides in food chains within different ecological habitats and on establishing their distribution within individual organisms at the tissue, cellular and subcellular levels.

K.1/5. Also, work will continue on the use of polonium-210 as a natural tracer in marine biological systems.

K.1/6. The vertical transport of radionuclides, trace elements and organochlorine compounds will be assessed through the analysis, at different points in time, of freshly released biogenic debris and of sinking particulate material collected in situ with sediment traps.

K.1/7. The Laboratory will continue to collaborate with other establishments in determining the bioavailability and behaviour of chlorinated hydrocarbons in benthic and pelagic organisms.

CO-OPERATION WITH OTHER ORGANIZATIONS

K.1/8. The Laboratory will co-operate with several oceanographic institutes in the United States in a research programme (VERTEX, sponsored by the US National Science Foundation) for assessing the vertical transport of pollutants in different oceanic regions; it will assist in sampling and be responsible for carrying out transuranic analyses. Continued collaboration in UNEP's Regional Seas Programme is envisaged.

## SUB-PROGRAMME K.2.

Marine chemistry

OBJECTIVE

K.2/1. The objective is to study the chemical behaviour of radioactive substances and other pollutants in the marine environment and, through a comprehensive intercalibration programme, to ensure the comparability of results obtained by national laboratories in their studies of radionuclides and other pollutants in the oceans.

RESULTS TO DATE

K.2/2. On the basis of the results of transuranic measurements carried out with samples collected in the Mediterranean region during the past five years, the characteristic geochemical behaviour of different transuranic elements in the Mediterranean environment has been demonstrated. The results show that the major source of transuranics in the Mediterranean is fallout and that the behaviour of plutonium isotopes is quite different from that of americium; plutonium tends to remain in solution much longer than americium, suggesting that the oxidation states of these elements may be different.

K.2/3. Measurements of trace metals and chlorinated hydrocarbons have shown that the levels of these pollutants in the open Mediterranean are not very different from those in other oceanic waters, although higher concentrations were sometimes observed in some coastal areas where industrial discharges are high.

K.2/4. Several intercalibration exercises for radionuclides, especially the transuranics, were organized in recent years. The results show that the comparability of $^{239+240}Pu$ measurements has improved significantly during this period, but there are still only a few laboratories which can produce reliable results with americium measurements.

K.2/5. Many national laboratories in many countries are participating in the UNEP-sponsored intercalibration programme for trace metal and chlorinated hydrocarbon measurements. In the case of the measurement of trace metals in marine biological samples, more than 100 laboratories in over 30 Member States have participated in the programme. The results show that the comparability of trace metal measurements for toxic metals such as copper, zinc, cadmium and mercury is fairly good, but the results of lead measurements were less comparable. As far as the low-level measurements of chlorinated hydrocarbons in marine environmental samples are concerned, encouraging results have been obtained showing significant improvement in the comparability of data.

PLANS FOR 1981–82

K.2/6. Since deep-sea transuranic data are still scarce and the sampling and analysis of deep-sea samples are time-consuming, studies of the deep-sea behaviour of transuranic elements will be devoted to accumulating as many in situ data as possible for various environmental matrices. It is expected that numerous deep-sea sediment samples, especially from the North Atlantic radioactive waste dumping site, will be analyzed and the results evaluated in co-operation with the "Marine geochemistry" sub-programme.

K.2/7. At least two large batches of reference samples, one sediment and the other biological materials, will be prepared for low-level measurements of transuranic elements.

K.2/8. In addition to the intercalibration programme for non-nuclear measurements sponsored by UNEP within the framework of the Mediterranean Pollution Monitoring and Research Programme, an intercalibration programme will be initiated for other regional seas.

RELATED ACTIVITIES

K.2/9. Staff of the Laboratory will participate in meetings related to the London Dumping Convention (see the "Nuclear Safety and Environmental Protection" programme) and in a co-ordinated research programme on transuranic cycling behaviour in the marine environment (Table C.6, No.10).

OUTLINE OF CHANGES DURING 1983–86

K.2/10. On the basis of data obtained during 1981–82, the studies of the deep-sea behaviour of transuranic elements will focus on interactions with various organic materials and the effects of oxido-reduction processes.

CO-OPERATION WITH OTHER ORGANIZATIONS

K.2/11. Continued co-operation in UNEP's Regional Seas Programme and, in this connection, further contacts with, for example, FAO and the International Oceanographic Commission of UNESCO are foreseen.

## SUB-PROGRAMME K.3.

### Marine geochemistry

OBJECTIVE

K.3/1. The objective is to determine the behaviour of radionuclides and selected non-radioactive contaminants in marine sediments and particulate matter, with emphasis on studies relating to the disposal of radioactive wastes into the oceans.

RESULTS TO DATE

K.3/2. Under the old "Environmental studies" sub-programme, research was concentrated on the relative uptake of radionuclides such as $^{54}Mn$, $^{59}Fe$ and $^{60}Co$ by sediments as opposed to biota. Non-radioactive pollutants such as chlorinated hydrocarbons were determined in Mediterranean sediments.

PLANS FOR 1981-82

K.3/3. It is expected that the Laboratory will participate in a co-ordinated field programme at the North Atlantic dumping site.

K.3/4. Specific studies will be directed towards sediment-water interactions involving transuranics and other selected radioisotopes. Types of sediment and particulate matter will be classified by conventional techniques; pore water studies will also be undertaken.

## RELATED ACTIVITIES

K.3/5. Close contact will be maintained with the "Nuclear Safety and Environmental Protection" programme in connection with the Agency's responsibilities under various international conventions concerning protection of the marine environment against the effects of radioactive waste disposal in the oceans.

## CO-OPERATION WITH OTHER ORGANIZATIONS

K.3/6. It is expected that close co-operation will develop between the Laboratory and NEA and IMCO. Continued co-operation with UNEP is envisaged.

# L. SAFEGUARDS

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table L.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 7 260 922 | 11 049 000 | 1 051 000 | 843 000 | 1 894 000 | 12 943 000 | 14 372 000 | 15 711 000 |
| Consultants | 29 378 | 62 300 | 6 500 | (18 600) | (12 100) | 50 200 | 56 000 | 57 000 |
| Overtime | 1 463 | 5 000 | 400 | (400) | – | 5 000 | 7 000 | 8 000 |
| Temporary assistance | 1 157 | 9 300 | 500 | (1 700) | (1 200) | 8 100 | 9 000 | 9 000 |
| Sub-total | 7 292 920 | 11 125 600 | 1 058 400 | 822 300 | 1 880 700 | 13 006 300 | 14 444 000 | 15 785 000 |
| Common staff costs | 2 213 933 | 3 203 500 | 486 500 | 257 000 | 743 500 | 3 947 000 | 4 455 000 | 4 870 000 |
| Travel | 1 127 817 | 1 387 300 | 207 200 | 204 500 | 411 700 | 1 799 000 | 2 090 000 | 2 472 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 36 557 | 64 000 | 4 000 | (35 000) | (31 000) | 33 000 | 71 000 | 67 000 |
| Technical committees, advisory groups | 101 836 | 198 000 | 25 000 | (26 000) | (1 000) | 197 000 | 229 000 | 263 000 |
| Representation and hospitality | 11 704 | 15 300 | 600 | (200) | 400 | 15 700 | 19 000 | 21 000 |
| Scientific and technical contracts | 186 661 | 565 000 | 43 000 | (18 000) | 25 000 | 590 000 | 995 000 | 1 005 000 |
| Scientific supplies and equipment | 592 096 | 1 040 700 | 104 000 | (9 700) | 94 300 | 1 135 000 | 1 822 000 | 1 866 000 |
| Common services, supplies and equipment | 123 873 | 121 300 | 10 700 | 6 000 | 16 700 | 138 000 | 335 000 | 362 000 |
| Other items of expenditure | – | 32 300 | 2 900 | (18 200) | (15 300) | 17 000 | 32 000 | 34 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 180 364 | 192 000 | 11 000 | 30 000 | 41 000 | 233 000 | 253 000 | 273 000 |
| Printing and publishing services | 243 396 | 134 000 | 13 000 | 21 000 | 34 000 | 168 000 | 223 000 | 305 000 |
| Data processing services | 1 978 723 | 2 389 000 | (79 000) | 51 000 | (28 000) | 2 361 000 | 2 546 000 | 2 735 000 |
| Laboratory services | 601 060 | 1 078 000 | 88 000 | – | 88 000 | 1 166 000 | 1 214 000 | 1 298 000 |
| Legal services | 138 000 | 160 000 | 12 000 | – | 12 000 | 172 000 | 180 000 | 190 000 |
| Conference services | – | 34 000 | 1 700 | (10 700) | (9 000) | 25 000 | 42 000 | 40 000 |
| TOTAL | 14 828 940 | 21 740 000 | 1 989 000 | 1 274 000 | 3 263 000 | 25 003 000 | 28 950 000 | 31 586 000 |

## SUMMARY OF MANPOWER

Table L.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| DDG | 1 | 1 | 1 | – | 1 | 1 | 1 |
| D | 4 | 4 | 4 | – | 4 | 4 | 4 |
| P-5 | 41 | 45 | 46 | 5 | 51 | 52 | 53 |
| P-4 | 87 | 95 | 95 | 8 | 103 | 109 | 115 |
| P-3 | 52 | 59 | 60 | 2 | 62 | 63 | 65 |
| Sub-total | 185 | 204 | 206 | 15 | 221 | 229 | 238 |
| GS | 97 | 118 | 118 | 15 | 133 | 141 | 146 |
| TOTAL | 282 | 322 | 324 | 30 | 354 | 370 | 384 |

## CHANGES IN COSTS AND MANPOWER

### Costs

L/1. As will be seen from Table L.1 above, it is expected that the cost of this programme will increase by $3 263 000, of which $1 989 000 will be required to cover salary and other price increases and $1 274 000 will be the overall programme increase.

L/2. The programme increase of $1 100 000 in respect of salaries for established posts and common staff costs is attributable to the addition of 15 Professional and 15 GS posts in the manning table for 1981 and to the transfer of two Professional posts to this programme in the adjusted manning table for 1980. Programme decreases are foreseen in respect of consultants' services ($18 600, primarily in the "Safeguards information treatment" and "Safeguards development and technical support" sub-programmes) and overtime and temporary assistance ($2 100). The programme increase of $204 500 in respect of travel is primarily for inspection travel.

L/3. Programme decreases are foreseen in respect of meetings. The decrease of $35 000 in respect of conferences, symposia and seminars is attributable to the intention not to hold training courses under the "Safeguards development and technical support" sub-programme in 1981 (the 1980 estimates included two training courses). The programme decrease of $26 000 in respect of technical committees and advisory groups is related to the "Safeguards information treatment" sub-programme, where it is planned to reduce the number of advisory group meetings.

L/4. Programme decreases are foreseen in respect of scientific and technical contracts ($18 000), scientific supplies and equipment ($9 700) and other items of expenditure ($18 200, in respect of staff training under the "Safeguards operations" sub-programme). A programme increase of $6 000 is foreseen in respect of common services, supplies and equipment.

L/5. As regards the allocation of service costs, programme increases are foreseen in respect of linguistic services ($30 000), printing and publishing services ($21 000, primarily under the "Standardization and administrative support" sub-programme) and data processing services ($51 000). The programme decrease of $10 700 in respect of conference services is related to the decrease in the number of meetings.

L/6. As can be seen from Table 1 (THE CONSOLIDATED BUDGET – 1981) and Table 5 (EXTRABUDGETARY RESOURCES 1979–1981), it is expected that the "Safeguards" programme will be supported by contributions amounting to $1 385 000, consisting of $185 000 from Canada, $200 000 from the Federal Republic of Germany and $1 million from the United States.

L/7. It is expected that income in the form of amounts recoverable under safeguards agreements from non-member States will total $110 000 in 1981.

Manpower

L/8. As will be seen from Table L.2 above, two Professional posts are transferred to this programme in the adjusted manning table for 1980. The addition of 15 Professional and 15 GS posts is foreseen for 1981. Detailed justifications are provided in Annex IV.

L/9. For 1982 the addition of eight Professional and eight GS posts and for 1983 the addition of nine Professional and five GS posts are foreseen.

## THE PROGRAMME

### OBJECTIVE

L/10. The objective is to apply safeguards under agreements to which the Agency is a party, through the establishment of safeguards concepts and criteria, the implementation of established safeguards procedures and practices and the coordination and furtherance of development work leading to the achievement of the safeguards objective in the most efficient way. The safeguards-related tasks and obligations of the Agency are generally defined by Articles III and XII of the Agency's Statute and by Article III of NPT. The working programme and the resources required are determined by the safeguards agreements concluded, in particular the facility attachments.

### RESULTS TO DATE

L/11. So far 149 safeguards agreements – 25 project agreements, 31 trilateral agreements, 15 unilateral submission agreements, 73 agreements with non-nuclear-weapon States in connection with NPT ( 17 of them in connection with both NPT and the Tlatelolco Treaty), two agreements in connection with the Tlatelolco Treaty only and three agreements with nuclear-weapon States on the basis of voluntary offers by these States – have been concluded.

L/12. With the entry into force of NPT safeguards agreements, the application of safeguards under other agreements with the countries concerned has in most cases been suspended. At the same time, there are NPT and non-NPT agreements in force whose provisions have not yet been implemented because the countries concerned have no material to be safeguarded under the agreements in question.

L/13. Accordingly, the Agency is applying safeguards in 50 States which have significant nuclear activities: in 29 States under NPT agreements, in 17 States under non-NPT agreements and in four States under both agreements in connection with NPT and other agreements.

### OUTLINE FOR 1981–86

L/14. The following table indicates the quantities of nuclear material expected to be under safeguards during the period 1981–86; the nuclear material expected to be subject to Agency safeguards pursuant to the voluntary offers made by France, the United Kingdom and the United States is not included.

Quantities of nuclear material under Agency safeguards
(excluding nuclear material to be safeguarded under agreements concluded pursuant to voluntary offers made by nuclear-weapon States)

1979–86

Table L.3

| Material | Amounts (tonnes) | | |
|---|---|---|---|
| | *1979* | *1981* | *1986* |
| Plutonium | 68 | 100–110 | 240–260 |
| Uranium enriched to 20% or more | 11.4 | 12.6 | 15.6 |
| Uranium enriched to less than 20% | 11 714 | 18 000–19 000 | 40 000–45 000 |
| Source material | 15 339 | 20 000–22 000 | 30 000–35 000 |

L/15. It is expected that, during the period 1981–86, the Standing Advisory Group on Safeguards Implementation (SAGSI) will continue to advise on technical aspects of safeguards implementation (Table L.14, No.1).

## RELATED ACTIVITIES

L/16. Technical support for the Agency's safeguards programme is provided by the Legal Division, the Division of External Relations, the Laboratory, the Computer Section and the Division of Nuclear Safety.

## CO-OPERATION WITH OTHER ORGANIZATIONS

L/17. The programme involves extensive co-operation with national and regional nuclear energy authorities.

## STRUCTURE

L/18. This programme consists of six sub-programmes, which are dealt with separately below. The Deputy Director General for Safeguards, supported by the Section for Standardization and Administrative Support and the Safeguards Evaluation Section, assures the overall planning, co-ordination, direction, and evaluation of the activities of the two Divisions of Operations, the Division of Development and Technical Support, the Division of Safeguards Information Treatment and the Safeguards Training Unit, each of which is involved in an interconnected manner in the implementation of the programme.

## SUB-PROGRAMMES

### Summary of manpower by organization unit and category

Table L.4

| Organization unit | 1979 Adjusted budget | | | 1980 Adjusted budget | | | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | GS | Total | P | GS | Total | P | GS | Total | P | GS | Total | P | GS | Total |
| Programme co-ordination | 2 | 5 | 7 | 2 | 5 | 7 | 2 | 6 | 8 | 2 | 6 | 8 | 2 | 6 | 8 |
| Safeguards operations A | 51 | 16 | 67 | 57 | 20 | 77 | 61 | 21 | 82 | 62 | 23 | 85 | 65 | 24 | 89 |
| Safeguards operations B | 73 | 23 | 96 | 81 | 24 | 105 | 87 | 26 | 113 | 91 | 28 | 119 | 93 | 29 | 122 |
| Safeguards development and technical support | 27 | 14 | 41 | 29 | 17 | 46 | 32 | 21 | 53 | 33 | 22 | 55 | 35 | 23 | 58 |
| Standardization and administrative support | 6 | 4 | 10 | 6 | 4 | 10 | 7 | 5 | 12 | 7 | 6 | 13 | 7 | 6 | 13 |
| Safeguards information treatment | 20 | 31 | 51 | 22 | 42 | 64 | 23 | 46 | 69 | 24 | 48 | 72 | 25 | 49 | 74 |
| Safeguards effectiveness evaluation | 6 | 4 | 10 | 9 | 6 | 15 | 9 | 8 | 17 | 10 | 8 | 18 | 11 | 9 | 20 |
| TOTAL | 185 | 97 | 282 | 206 | 118 | 324 | 221 | 133 | 354 | 229 | 141 | 370 | 238 | 146 | 384 |

## Costs of safeguards programme co-ordination

Table L.5

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 207 429 | 214 000 | 19 000 | 15 000 | 34 000 | 248 000 | 262 000 | 277 000 |
| Overtime | 254 | 700 | 100 | 100 | 200 | 900 | 900 | 900 |
| Sub-total | 207 683 | 214 700 | 19 100 | 15 100 | 34 200 | 248 900 | 262 900 | 277 900 |
| Common staff costs | 63 318 | 61 700 | 9 300 | 4 000 | 13 300 | 75 000 | 81 200 | 85 800 |
| Travel | 6 398 | 4 700 | 700 | 10 200 | 10 900 | 15 600 | 16 500 | 16 500 |
| Meetings | | | | | | | | |
| Technical committees, advisory groups | 53 898 | 62 000 | 9 000 | 1 000 | 10 000 | 72 000 | 78 000 | 79 000 |
| Representation and hospitality | 3 609 | 2 500 | – | – | – | 2 500 | 2 500 | 2 500 |
| Scientific supplies and equipment | 592 096 | 1 040 700 | 104 000 | (9 700) | 94 300 | 1 135 000 | 1 822 000 | 1 866 000 |
| Common services, supplies and equipment | 112 086 | 3 700 | 300 | – | 300 | 4 000 | 4 000 | 4 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 97 562 | 26 000 | 1 500 | 26 500 | 28 000 | 54 000 | 70 000 | 80 000 |
| Printing and publishing services | 11 597 | 29 000 | 3 200 | 5 800 | 9 000 | 38 000 | 37 000 | 45 000 |
| Conference services | – | 3 000 | 200 | 800 | 1 000 | 4 000 | 4 000 | 4 000 |
| TOTAL | 1 148 247 | 1 448 000 | 147 300 | 53 700 | 201 000 | 1 649 000 | 2 378 100 | 2 460 700 |

## Costs of safeguards operations A

Table L.6

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 056 660 | 2 820 000 | 285 000 | 155 000 | 440 000 | 3 260 000 | 3 575 000 | 3 930 000 |
| Overtime | – | – | – | 700 | 700 | 700 | 800 | 900 |
| Temporary assistance | 1 012 | 2 300 | 100 | (200) | (100) | 2 200 | 2 200 | 2 200 |
| Sub-total | 2 057 672 | 2 822 300 | 285 100 | 155 500 | 440 600 | 3 262 900 | 3 578 000 | 3 933 100 |
| Common staff costs | 627 152 | 817 900 | 130 200 | 47 000 | 177 200 | 995 100 | 1 108 200 | 1 218 300 |
| Travel | 522 689 | 580 300 | 87 700 | 51 000 | 138 700 | 719 000 | 862 000 | 1 088 000 |
| Representation and hospitality | 2 826 | 2 400 | 100 | 500 | 600 | 3 000 | 3 300 | 3 500 |
| Common services, supplies and equipment | 11 426 | 89 900 | 9 100 | 1 000 | 10 100 | 100 000 | 238 000 | 251 000 |
| Other items of expenditure | – | 16 200 | 1 500 | (8 700) | (7 200) | 9 000 | 16 000 | 17 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 27 412 | 37 000 | 2 000 | 2 000 | 4 000 | 41 000 | 38 000 | 40 000 |
| Printing and publishing services | 11 691 | 19 000 | 1 800 | (3 800) | (2 000) | 17 000 | 18 000 | 19 000 |
| Legal services | 69 000 | 80 000 | 6 000 | – | 6 000 | 86 000 | 90 000 | 95 000 |
| TOTAL | 3 329 868 | 4 465 000 | 523 500 | 244 500 | 768 000 | 5 233 000 | 5 951 500 | 6 664 900 |

## Costs of safeguards operations B

Table L.7

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 060 745 | 3 892 000 | 318 000 | 240 000 | 558 000 | 4 450 000 | 4 956 000 | 5 363 000 |
| Overtime | – | – | – | 700 | 700 | 700 | 800 | 900 |
| Temporary assistance | 145 | 3 500 | 200 | (400) | (200) | 3 300 | 3 300 | 3 300 |
| Sub-total | 2 060 890 | 3 895 500 | 318 200 | 240 300 | 558 500 | 4 454 000 | 4 960 100 | 5 367 200 |
| Common staff costs | 628 398 | 1 128 200 | 156 800 | 73 000 | 229 800 | 1 358 000 | 1 536 300 | 1 662 500 |
| Travel | 539 719 | 712 600 | 106 400 | 144 000 | 250 400 | 963 000 | 1 099 000 | 1 250 000 |
| Representation and hospitality | 968 | 2 100 | 100 | 800 | 900 | 3 000 | 3 300 | 3 500 |
| Common services, supplies and equipment | – | 12 500 | 500 | – | 500 | 13 000 | 14 000 | 15 000 |
| Other items of expenditure | – | 16 100 | 1 400 | (9 500) | (8 100) | 8 000 | 16 000 | 17 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | – | 36 000 | 2 000 | – | 2 000 | 38 000 | 38 000 | 40 000 |
| Printing and publishing services | – | 19 000 | 1 800 | (3 800) | (2 000) | 17 000 | 18 000 | 19 000 |
| Legal services | 69 000 | 80 000 | 6 000 | – | 6 000 | 86 000 | 90 000 | 95 000 |
| TOTAL | 3 298 975 | 5 902 000 | 593 200 | 444 800 | 1 038 000 | 6 940 000 | 7 774 700 | 8 469 200 |

## Costs of safeguards development and technical support

Table L.8

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 168 793 | 1 660 000 | 160 000 | 173 000 | 333 000 | 1 993 000 | 2 217 000 | 2 454 000 |
| Consultants | 4 046 | 28 500 | 3 500 | (4 000) | (500) | 28 000 | 33 800 | 34 800 |
| Overtime | 62 | 500 | – | 200 | 200 | 700 | 800 | 900 |
| Sub-total | 1 172 901 | 1 689 000 | 163 500 | 169 200 | 332 700 | 2 021 700 | 2 251 600 | 2 489 700 |
| Common staff costs | 356 408 | 480 800 | 74 500 | 53 000 | 127 500 | 608 300 | 687 200 | 760 600 |
| Travel | 48 106 | 65 800 | 8 700 | (7 500) | 1 200 | 67 000 | 77 200 | 82 100 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | – | 36 000 | – | (36 000) | (36 000) | – | 37 000 | 32 000 |
| Technical committees, advisory groups | 17 907 | 88 000 | 12 000 | (1 000) | 11 000 | 99 000 | 125 000 | 158 000 |
| Representation and hospitality | 2 706 | 5 700 | 300 | (2 000) | (1 700) | 4 000 | 6 300 | 7 500 |
| Scientific and technical contracts | 186 661 | 540 000 | 41 000 | (21 000) | 20 000 | 560 000 | 965 000 | 975 000 |
| Common services, supplies and equipment | – | 11 700 | 600 | 700 | 1 300 | 13 000 | 14 000 | 15 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 45 598 | 50 000 | 3 000 | 1 000 | 4 000 | 54 000 | 64 000 | 68 000 |
| Printing and publishing services | 193 519 | 38 000 | 4 200 | 12 800 | 17 000 | 55 000 | 127 000 | 175 000 |
| Laboratory services | 601 060 | 1 078 000 | 88 000 | – | 88 000 | 1 166 000 | 1 214 000 | 1 298 000 |
| Conference services | – | 20 000 | 1 000 | (12 000) | (11 000) | 9 000 | 26 000 | 26 000 |
| TOTAL | 2 624 866 | 4 103 000 | 396 800 | 157 200 | 554 000 | 4 657 000 | 5 594 300 | 6 086 900 |

## Costs of standardization and administrative support

Table L.9

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 310 289 | 359 000 | 44 000 | 56 000 | 100 000 | 459 000 | 521 000 | 550 000 |
| Overtime | – | 500 | 100 | 100 | 200 | 700 | 800 | 900 |
| Sub-total | 310 289 | 359 500 | 44 100 | 56 100 | 100 200 | 459 700 | 521 800 | 550 900 |
| Common staff costs | 94 717 | 104 400 | 19 000 | 17 000 | 36 000 | 140 400 | 161 500 | 170 500 |
| Travel | 2 358 | 2 700 | 500 | – | 500 | 3 200 | 3 300 | 3 400 |
| Representation and hospitality | 495 | 400 | – | 300 | 300 | 700 | 800 | 1 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 5 304 | 25 000 | 1 500 | 500 | 2 000 | 27 000 | 26 000 | 28 000 |
| Printing and publishing services | 19 304 | 3 000 | 200 | 20 800 | 21 000 | 24 000 | 4 000 | 25 000 |
| TOTAL | 432 467 | 495 000 | 65 300 | 94 700 | 160 000 | 655 000 | 717 400 | 778 800 |

## Costs of safeguards information treatment

Table L.10

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 144 036 | 1 687 000 | 162 000 | 102 000 | 264 000 | 1 951 000 | 2 160 000 | 2 357 000 |
| Consultants | 25 332 | 33 800 | 3 000 | (14 600) | (11 600) | 22 200 | 22 200 | 22 200 |
| Overtime | 865 | 2 500 | 100 | (2 200) | (2 100) | 400 | 1 900 | 2 500 |
| Temporary assistance | – | 3 500 | 200 | (1 100) | (900) | 2 600 | 3 500 | 3 500 |
| Sub-total | 1 170 233 | 1 726 800 | 165 300 | 84 100 | 249 400 | 1 976 200 | 2 187 600 | 2 385 200 |
| Common staff costs | 348 859 | 489 400 | 75 400 | 31 000 | 106 400 | 595 800 | 669 600 | 730 600 |
| Travel | 8 145 | 18 000 | 2 700 | 5 300 | 8 000 | 26 000 | 25 800 | 25 800 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 36 557 | 28 000 | 4 000 | 1 000 | 5 000 | 33 000 | 34 000 | 35 000 |
| Technical committees, advisory groups | 30 031 | 48 000 | 4 000 | (26 000) | (22 000) | 26 000 | 26 000 | 26 000 |
| Representation and hospitality | 954 | 1 800 | 100 | 100 | 200 | 2 000 | 2 300 | 2 500 |
| Scientific and technical contracts | – | 25 000 | 2 000 | 3 000 | 5 000 | 30 000 | 30 000 | 30 000 |
| Common services, supplies and equipment | 361 | – | – | 4 000 | 4 000 | 4 000 | 64 000 | 76 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 4 488 | 18 000 | 1 000 | – | 1 000 | 19 000 | 17 000 | 17 000 |
| Printing and publishing services | 7 169 | 26 000 | 1 800 | (10 800) | (9 000) | 17 000 | 19 000 | 22 000 |
| Data processing services | 1 978 723 | 2 389 000 | (79 000) | 51 000 | (28 000) | 2 361 000 | 2 546 000 | 2 735 000 |
| Conference services | – | 11 000 | 500 | 500 | 1 000 | 12 000 | 12 000 | 10 000 |
| TOTAL | 3 585 520 | 4 781 000 | 177 800 | 143 200 | 321 000 | 5 102 000 | 5 633 300 | 6 095 100 |

## Costs of safeguards effectiveness evaluation

Table L.11

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 312 970 | 417 000 | 63 000 | 102 000 | 165 000 | 582 000 | 681 000 | 780 000 |
| Overtime | 282 | 800 | 100 | – | 100 | 900 | 1 000 | 1 000 |
| Sub-total | 313 252 | 417 800 | 63 100 | 102 000 | 165 100 | 582 900 | 682 000 | 781 000 |
| Common staff costs | 95 081 | 121 100 | 21 300 | 32 000 | 53 300 | 174 400 | 211 000 | 241 700 |
| Travel | 402 | 3 200 | 500 | 1 500 | 2 000 | 5 200 | 6 200 | 6 200 |
| Representation and hospitality | 146 | 400 | – | 100 | 100 | 500 | 500 | 500 |
| Common services, supplies and equipment | – | 3 500 | 200 | 300 | 500 | 4 000 | 1 000 | 1 000 |
| Transfer of costs: | | | | | | | | |
| Printing and publishing services | 116 | – | – | – | – | – | – | – |
| TOTAL | 408 997 | 546 000 | 85 100 | 135 900 | 221 000 | 767 000 | 900 700 | 1 030 400 |

## SUB-PROGRAMME L.1

### Safeguards operations

### OBJECTIVE

L.1/1. The objective is to apply safeguards pursuant to agreements in connection with NPT and with the Tlatelolco Treaty and to unilateral submission agreements, safeguards transfer agreements and project agreements concluded under the Agency's Safeguards System (1965, as Provisionally Extended in 1966 and 1968) [L.1], the main activities involved in fulfilling this objective including:

(a) Collection and evaluation of design information;
(b) Evaluation of nuclear material accountancy;
(c) Performance of inspections for the purposes of verifying information received from States and the application of containment and surveillance measures;
(d) Preparation and formulation of technical conclusions on nuclear material accountancy;
(e) Technical preparation of subsidiary arrangements; and
(f) Elaboration and updating of Safeguards Implementation Practices (SIPs).

### RESULTS TO DATE

L.1/2. Safeguards are at present being applied in 50 States under nine project agreements, 20 trilateral agreements, 13 unilateral submission agreements and 27 agreements concluded with non-nuclear-weapon States in connection with NPT.

L.1/3. During the past six years about 3600 inspections were carried out. In addition, two facilities were under continuous inspection in 1977 and three in 1978.

### PLANS FOR 1981–82

L.1/4. It is expected that the number of States where the Agency will be applying safeguards in 1982 will not exceed by much the present number of States having nuclear material subject to safeguards.

L.1/5. The workload is expected to grow during the period 1981–83 as a result of the expansion of nuclear activities in States having safeguards agreements with the Agency and because of the initiation of Agency safeguards at nuclear facilities in nuclear-weapon States.

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[L.1] Reproduced in document INFCIRC/66/Rev.2.

Nuclear installations subject to safeguards or containing safeguarded material[a]
(excluding installations to be covered by agreements concluded
pursuant to voluntary offers made by nuclear-weapon States)

1979–83

Table L.12

| Type of installation | 1979 | | 1980 | | 1981 | | 1982 | | 1983 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | NPT agreements | Other agreements | NPT agreements | Other agreements | NPT agreements | Other agreements | NPT agreements | Other agreements | NPT agreements | Other agreements |
| Power reactors | 94 | 23 | 101 | 24 | 119 | 24 | 119 | 27 | 139 | 32 |
| Research reactors and critical assemblies | 140 | 31 | 143 | 31 | 145 | 31 | 146 | 32 | 147 | 32 |
| Conversion plants | 4 | – | 5 | – | 5 | – | 6 | – | 6 | 1 |
| Fuel fabrication plants | 28 | 5 | 29 | 6 | 29 | 7 | 31 | 7 | 31 | 7 |
| Reprocessing plants | 4 | 1 | 4 | 2 | 4 | 2 | 6 | 2 | 6 | 2 |
| Enrichment plants | 4 | – | 4 | – | 4 | – | 5 | – | 7 | – |
| Separate storage facilities | 14 | 5 | 16 | 3 | 16 | 3 | 16 | 3 | 16 | 3 |
| Other facilities (> 1 ekg) | 40 | – | 40 | – | 40 | – | 40 | – | 40 | – |
| Other locations (< 1 ekg) | 289 | 18 | 289 | 18 | 290 | 18 | 291 | 18 | 292 | 18 |
| TOTAL | 617 | 83 | 631 | 84 | 652 | 85 | 660 | 89 | 684 | 95 |

[a] The categorization of nuclear installations used for this table differs somewhat from that which was used for Table K.3 in document GC(XXIII)/612, being based on definitions which are better suited to the Agency's present safeguards implementation practice and which will be used in future documents.

RELATED ACTIVITIES

L.1/6. The monitoring of personnel for radiation doses received on duty in the field will be carried out by the Division of Nuclear Safety and Environmental Protection. The Division of Scientific and Technical Information will provide computer services for the processing of safeguards data. The Legal Division and the Division of External Relations will participate in the negotiation of safeguards agreements. The Department of Research and Isotopes will operate the Safeguards Analytical Laboratory (SAL), the programme of which is supervised by the Division of Development and Technical Support.

OUTLINE OF CHANGES DURING 1983–86

L.1/7. During this period, which should see a continuing increase in the proportion of the world's electric energy demand being met by nuclear power, the inspectorate is expected to grow more slowly than the amount of nuclear materials under safeguards since the verification effort is not proportional to this amount and more effective verification techniques and instruments will probably become available.

CO-OPERATION WITH OTHER ORGANIZATIONS

L.1/8. The economical implementation of this sub-programme will continue to depend on the co-operation of national and regional authorities responsible for administering States' systems of accounting for and control of nuclear material (SSACs) and for the management of safeguarded facilities. The co-operation of States in providing training in specialized fields will continue to be sought.

## SUB-PROGRAMME L.2

### Safeguards development and technical support

OBJECTIVE

L.2/1. The objective is to provide procedures, techniques, equipment and technical support for achieving the technical objectives of safeguards in the most effective and economical way, the main activities involved in fulfilling this objective including:

(a) Direct support for operational activities through the provision of technical services such as the procurement, storage, testing, calibration, maintenance, servicing, shipment and installation of safeguards instruments and equipment, the instruction of inspectors, arrangements for the shipment and analysis of samples, supervision of the programme of and the work performed at the Agency's Safeguards Analytical Laboratory, the specification and procurement of physical standards and reference materials and the formulation of procedures for implementing techniques for containment, surveillance and nuclear material measurement and accountancy;
(b) Support for operational activities through the development, optimization and introduction into operational use of destructive and non-destructive assay instruments and techniques, surveillance instruments, containment techniques and seals and through the co-ordination of research and development in those fields; and
(c) The improvement of safeguards effectiveness through the further development, the refinement and the evaluation of safeguards objectives, concepts, approaches and criteria and the forecasting of fuel cycle activities and of inspection and consequent manpower requirements.

RESULTS TO DATE

L.2/2. In 1979, the Technical Services Section developed the capability to discharge the responsibilities outlined in sub-paragraph (a) above. An inventory of equipment for non-destructive analysis and for containment and surveillance has been built up to meet the needs of the Divisions of Operations. Equipment and expertise for maintaining and calibrating gamma-ray spectrometers and neutron counters have been acquired. The preventive maintenance of equipment located in the field is now undertaken on a routine basis and the serviceability and effectiveness of such equipment have been significantly increased.

L.2/3. A 'Safeguards Instruments Laboratory' has been set up at Seibersdorf for the purpose of testing and calibrating equipment, training inspectors and storing nuclear materials.

L.2/4. In 1978–79, the Section for the Development of Instruments, Methods and Techniques, extensively supported by several Member States, performed the tasks outlined in sub-paragraph (b) above. The result was the development, testing and partial introduction in the field of the following items of equipment:

(a) Portable, battery-powered television surveillance system;
(b) Prototype electro-optical instrument for the semi-automatic scanning of 8 mm surveillance film;
(c) Reactor power monitor;
(d) Portable, battery-powered NaI gamma spectrometer;
(e) Hand-held, high-resolution intrinsic germanium detector;
(f) Prototype small-sample calorimeter.

Also, efforts were devoted to:

(g) Improving the procedures for the application and verification of type-E seals;
(h) Improving spent fuel measurement techniques;
(i) Improving high-resolution gamma spectroscopy data reduction procedures;
(j) Developing isotopic correlation techniques, in part through a co-ordinated research programme (Table L.13, No.1);
(k) Improving safeguards at the reprocessing plant at Tokai Mura, Japan, through a joint programme (TASTEX) and also with the help of results obtained through a co-ordinated research programme (Table L.13, No.2).

L.2/5. The Section for System Studies developed:

(a) Safeguards procedures for the main types of facilities under safeguards, such as fuel fabrication plants, LWRs, CANDU-type reactors, HTGRs, fast breeder reactors and – in part through a co-ordinated research programme (Table L.13, No.3) – critical assemblies;
(b) Safeguards concepts and criteria, such as significant quantities and timeliness of detection, which have been evaluated by SAGSI;
(c) Criteria and a methodology for safeguards effectiveness evaluation;
(d) A computerized data base system for forecasting nuclear activities expected to come under safeguards (updated forecasts of nuclear facilities and material under safeguards up to 1990 have been made);
(e) Recommendations for establishing and maintaining SSACs.

L.2/6. The work of the Division of Development and Technical Support has been significantly promoted and accelerated by the comprehensive assistance of several Member States.

## PLANS FOR 1981–82

L.2/7. As part of the overall safeguards development effort, a symposium on recent advances in nuclear materials safeguards will be held in 1982 (Annex II (15)).

L.2/8. The Technical Services Section will continue its activities relating to the transport of inspection samples and the supervision of their analysis at SAL. Arrangements will be made to acquire standards for both chemical and non-destructive analyses performed by SAL, by the network of analytical laboratories and by inspectors in the field in order to increase the accuracy of these analyses. Chemical analysis techniques will be upgraded and SAL's capacity expanded to permit handling of the increased number of samples to be assayed. The resin bead technique for sampling production streams will be implemented as a routine operational tool. The Technical Services Section's capabilities for the maintenance, repair, testing and calibration of NDA equipment will continue to be improved. Recently developed NDA equipment, although more powerful, is also more complex (utilization of microprocessor technology) and the Section will require further expertise in order to maintain it.

L.2/9. All in-field photo and video surveillance units will be gradually replaced by equipment having higher reliability. However, the new equipment will have additional sophisticated electronic features, so that maintenance problems will continue. Present in-field depots of replacement parts for video systems will be expanded.

L.2/10. The Section for the Development of Instruments, Methods and Techniques, supported by several Member States, will continue to develop safeguards equipment through all necessary stages (from the prototype to the professional instrument stage) and to introduce it into routine inspection work with a view to improving the cost-effectiveness of safeguards operations. The following tasks are to be undertaken:

(a) Development and implementation of improved optical surveillance equipment (highly reliable camera systems capable of accommodating high-capacity film cartridges; video surveillance systems incorporating the latest technology related to picture quality and reliability);

(b) Development and implementation of sealing systems which permit in situ verification and of semi-automatic equipment for type-E metallic seal identification;
(c) Implementation of semi-automatic scanners for super 8 mm film (at the Agency's Headquarters and possibly in regional offices);
(d) Development of integrated monitoring systems using radiation and motion sensors;
(e) Continuation of development work on nuclear material containers with improved tamper resistance/tamper-indicating features;
(f) Continuation of the development of improved portable NDA instruments (one of the instruments with the highest priority is a battery-operated 1000-channel analyser for use with both NaI and intrinsic germanium gamma detectors);
(g) Development and implementation of transportable NDA instruments employing active neutron interrogation for the assay of various forms of uranium and mixed oxide materials;
(h) Evaluation of the experience gained in Europe with the Agency's first equipment van (leading to the wider use of vans and van-transportable equipment);
(i) Upgrading of data analysis procedures employed with the ND 6620 gamma ray analyser and the IBM/370 computer in the light of safeguards requirements and instrumentation evolution (more powerful, microprocessor-based equipment, sometimes directly interfaced with NDA equipment will come into use in the longer term).

L.2/11. In connection with the tasks enumerated in sub-paragraphs (a)–(e) above, requirements in the area of containment and surveillance instrumentation and ways of meeting these requirements will be examined (Table L.14, No.2). In support of work on the tasks described in sub-paragraphs (f) and (g) above, a similar examination of requirements and ways of meeting them in the NDA field will take place (Table L.14, No.3). A particular application of the portable NDA instruments referred to in sub-paragraph (f) above will be in performing measurements on spent fuel, and in this connection advice will be formulated on the use of safeguards instrumentation for nuclear material of high strategic importance (Table L.14, No.4). The task described in sub-paragraph (i) above relates to the analysis of data derived from instruments used inter alia at reprocessing facilities, and advice on the types of instruments needed at such facilities will be formulated (Table L.14, No.5).

L.2/12 Staff of the Division of Development and Technical Support will continue to participate in inspections where particularly sophisticated measurements are necessary. It is expected that such participation might be required during 1980–82 in connection with reprocessing plants, spent fuel storage facilities, fast critical assemblies and mixed oxide fuel fabrication plants.

L.2/13. The System Studies Section will focus its efforts on:
(a) Reviewing the main safeguards criteria and objectives, in particular those related to the timely detection of significant quantities of nuclear material (Table L.14, No.6).
(b) Developing and updating the methodology for ensuring safeguards effectiveness and for the quantification of containment/surveillance measures and other qualitative measures;
(c) Establishing detailed guidelines for inspection activities, with special emphasis on nuclear facilities processing and handling materials from which nuclear explosive devices could readily be made;
(d) Formulating guidelines for nuclear facility design, so as to minimize the intrusiveness and increase the cost-effectiveness of safeguards measures;
(e) Continuously reviewing and updating forecasts of nuclear material and facilities under safeguards and estimates of manpower and budget requirements;
(f) Continuing to assist Member States in establishing and maintaining SSACs, including the provision of Agency experts and the organization of basic and advanced training courses on SSACs.

L.2/14. In connection with the task mentioned in sub-paragraph (a) above, a review will be undertaken of the application of safeguards to different types of fuel cycles with allowance for the correlation between different facilities (Table L.14, No.6). In support of work on the task described in sub-paragraph (b) above, the methodology employed in safeguards effectiveness evaluation will be reviewed and ways of improving it suggested (Table L.14, No.7). The task described in sub-paragraph (c) above relates to particularly sensitive facilities, various aspects of safeguarding which will be examined (Table L.14, Nos.8 and 9). To enable the Agency to continue assisting Member States in establishing and maintaining SSACs, as outlined in sub-paragraph (f) above, detailed guidelines on the functioning of SSACs and recommendations on particular aspects of SSAC operations will be formulated (Table L.14, Nos. 10 and 11).

OUTLINE OF CHANGES DURING 1983–86

L.2/15. The experience gained through the operational use of various instruments and techniques will be continuously reviewed for the purpose of ensuring that the Agency has the best possible equipment for meeting its obligations at the lowest cost to itself and of minimizing the impact of Agency inspections on facility operators and operating States.

L.2/16. In order to achieve effective implementation of Agency safeguards, development activities will continue in the field of safeguards objectives, criteria and procedures, in safeguards system design, in the standardization of inspection activities and in the evaluation of safeguards effectiveness. Particular emphasis will be placed on safeguarding large-scale nuclear facilities and on updating and further developing safeguards concepts and approaches for types of facilities already under safeguards.

CO-OPERATION WITH OTHER ORGANIZATIONS

L.2/17. As the Agency does not have safeguards research facilities of its own, further technical developments in the field of safeguards will depend to a large extent on the assistance of Member States. Assistance has been offered by several Member States, and it is expected that during the period 1981–83 (in addition to the cost-free services of five to eight experts) research and development work equivalent to more than $5 million will be carried out in Member States in direct support of Agency safeguards. To ensure the most effective use of the results of this work, Agency staff will participate in its planning, co-ordination and execution.

## SUB-PROGRAMME L.3

### Safeguards information treatment

OBJECTIVE

L.3/1. The objective is to process all types of safeguards data, provide services relating to data base input and output and the evaluation of safeguards data and results, and continue developing and implementing the advanced safeguards information system in order to make available improved tools for data processing and evaluation, the main activities involved in fulfilling this objective including:

(a) Co-ordination and facilitation of the flow of safeguards information and the maintenance of data security;
(b) The operation of input analysis, computer program and output control services, the provision of documentation and training in connection with safeguards information treatment and evaluation, and the maintenance of a central safeguards data bank;
(c) Continuation of the development, implementation and documenting of procedures and computer programs for safeguards information treatment; and
(d) The provision of data evaluation services relating to inspection working papers, inspection sampling plans, measurement results, analytical results, inspection reports, safeguards statements to be transmitted to individual countries and safeguards implementation reports to be submitted to the Board of Governors.

RESULTS TO DATE

L.3/2. A computer-based system for the processing of nuclear material accounting data supplied by States has been in use since 1974. As of 31 December 1979, the associated safeguards data base consisted of more than 23 000 reports containing over 550 000 records; in addition, over 20 000 records from inspection reports were added to the data base during 1979. The rate of input to the data base is now about 18 000 records a month. During 1979, approximately 25 000 queries were put to the system – in order to satisfy the data needs of the inspectorate, the Safeguards Evaluation Section and the management of the Department of Safeguards – and the resulting output from the system analysed. Results from queries were distributed to inspectors, to country officers and to management and were included in the Safeguards Implementation Report.

L.3/3. Computerization of the comparison of records from SSACs and from inspection reports has been expanded, with a view to expediting support for inspectors in their evaluation work. It covers inspection plans and inspection report summaries, book inventory updates, seals data and other, minor data.

L.3/4. In January 1979, the advanced International Safeguards Information System (ISIS) began production data loading in parallel with the current system; all data from before January 1979 was loaded during February and March. All software has been completed in accordance with the design specifications and, after initial testing, the system has gone into routine test operations in parallel with the current system. The ISIS data base is being made available to the inspectorate on a direct-access basis through the installation of a video display unit in each regional section.

L.3/5. Numerous data evaluation services have been performed for inspectors in connection with the calibration of physical standards, the preparation of sampling plans, evaluation of the quality of destructive and non-destructive measurements, the evaluation of physical inventory verification data and the use of isotope correlation procedures to verify uranium burnup and plutonium production in spent fuel reprocessing.

L.3/6. Progress has been made in defining data elements, data collection formats and computer files for the storage and retrieval of inspection data needed in order to automate inspection data evaluation and provide summary results for inclusion in inspection reports. In order to promote implementation of the data evaluation system, guidelines for the stratification of nuclear materials, the sampling of nuclear materials and facility measurement control programmes were issued and used in training courses for SSAC personnel and inspectors. In addition, Advisory Group meetings on isotope correlation methods and on the quality of analytical laboratory measurements and non-destructive field measurements have been held in order to develop a uniform approach to the evaluation of inspection data.

L.3/7. Five consecutive seminars for SSAC personnel were held annually from 1975 to 1979; they were attended by personnel from both NPT and non-NPT States. The aim was to improve participants' understanding of the accuracy and other requirements which should be met in reports submitted to the Agency pursuant to the provisions set forth in Agency documents INFCIRC/153 and INFCIRC/66/Rev.2.

L.3/8. Staff members from the Division of Safeguards Information Treatment have accompanied inspectors during inspections in order to assist in auditing facility records, in reconciling records and reports and in updating design information and book inventories.

## PLANS FOR 1981–82

L.3/9. Software development will continue, mainly in the area of inspection reports and inspection working papers.

L.3/10. It is expected that the following volumes of input data will have to be processed as the amount of computerized data increases:

| Year | Accounting records | Inspection and other records |
|---|---|---|
| 1980 | 500 000 | 100 000 |
| 1981 | 600 000 | 120 000 |
| 1982 | 700 000 | 150 000 |

L.3/11. Workshop seminars on the processing and evaluation of safeguards information will be held for SSAC personnel in 1981 and 1982 (Annex I (17) and II (16)); courses on the same subject will also be organized for Agency inspectors.

L.3/12. The programme under which inspectors in the field are assisted by experienced staff members from the Division of Safeguards Information Treatment will be expanded.

L.3/13. Work on data evaluation will continue to be co-ordinated with the activities of the Safeguards Evaluation Section; it will include the organization of the information flow, the development of further sampling plans and the provision of statistical services.

L.3/14. The development of inspection data evaluation procedures will continue, with emphasis on raw data collection methods, data quality and data input into computer files, the aim being to facilitate access for the application of evaluation methodology.

L.3/15. The use of transportable minicomputers at important facilities under continuous inspection will start with the purchase of two models: a Headquarters model for software development and a field model for testing the concept at a reprocessing plant.

L.3/16. To facilitate data collection, training documents will be prepared and courses held as inspection data evaluation system development expands. Evaluations of the quality of safeguards data obtained by non-destructive and destructive measurement techniques will be reviewed in 1981 and 1982 respectively (Table L.14, No. 12). Also, consultants will review important evaluation methods (for example, isotope correlation methods) needed for facilitating the provision of evaluation services.

L.3/17. Routine evaluation services will continue in parallel with system development; this means that very experienced and highly qualified staff will be needed. It is expected that initially the split between system development and routine evaluation services will be about 70/30, changing to about 30/70 by 1986.

RELATED ACTIVITIES

L.3/18. It is expected that the volume of safeguards data to be processed and evaluated will continue to increase. A thorough assessment of future safeguards computing requirements in terms of the efficiency and timeliness of computer services, data security and cost effectiveness will be made. The necessary hardware and software will continue to be provided through co-operation between the Division of Safeguards Information Treatment and the Computer Section (for security reasons, the main hardware components may have to be accommodated within the area occupied by the Department of Safeguards).

## SUB-PROGRAMME L.4

### Safeguards effectiveness evaluation

OBJECTIVE

L.4/1. The objective is to carry out independent assessments of safeguards statements to be transmitted to individual countries, to ensure a continuing evaluation of the effectiveness of safeguards activities and to recommend the improvement of the safeguards system where it is deemed necessary, the main activities involved in fulfilling this objective including:

(a) The review of inspection reports, analysis of the difficulties encountered in the planning and implementation of inspections and the formulation of proposals for improvements in inspection activities;
(b) The monitoring of all activities relating to evaluation of the effectiveness of the safeguards system;
(c) Guiding the evaluation process and co-operating with other units within the Agency in improving the safeguards system and the effectiveness of safeguards implementation;
(d) Continuous evaluation of the effectiveness of safeguards implementation; and
(e) The formulation of conclusions regarding safeguards effectiveness, particularly in the Safeguards Implementation Report.

RESULTS TO DATE

L.4/2. This sub-programme was established in 1977. During 1978 and 1979, the Safeguards Evaluation Section processed the following (the numbers in parenthesis are the fraction clarified or corrected as a result of processing):

| | 1978 | 1979 |
|---|---|---|
| Inspection reports | 804 (86%) | 1058 (52%) |
| NPT statements relevant to | | |
| para. 90(a) of INFCIRC/153 | 332 (88%) | 852 (40%) |
| para. 90(b) of INFCIRC/153 | 164 (18%) | 90 (39%) |
| Conclusion letters relevant to | | |
| INFCIRC/66-type agreements | 116 (1%) | 77 (3%) |

L.4/3. A Safeguards Implementation Report (SIR) was compiled for each of the years 1977 and 1978.

L.4/4. A programme for improving the concepts employed in evaluating and presenting the overall effectiveness of Agency safeguards in an increasingly quantitative and objective manner was conducted in conjunction with the preparation of the two SIRs. This programme has continued after the completion of each SIR and should lead to a steady improvement in the clarity and credibility of future SIRs.

L.4/5. A temporary method for gathering most of the information required for the SIRs was introduced in 1978; early in 1979, a computerized mechanism was introduced for collecting some of that information on a more routine basis.

L.4/6. In co-operation with the Section for System Studies, Division of Development and Technical Support, a long-term programme has been initiated for the development and testing of a methodology for determining the completeness of inspection work as required by the applied safeguards concept, the confidence level of the quantitative findings, the probability of detection in the event that significant quantities of nuclear material are missing, and the possible timeliness of such detection.

## PLANS FOR 1981–82

L.4/7. The reviewing of inspection reports, of NPT statements and of conclusion letters relevant to INFCIRC/66 – type agreements will continue. Approximately 1 300 inspection reports will be reviewed in 1981. The group responsible for reviewing will expand its activities, on a random sampling basis at least, to include inspection results as contained in the supporting working papers used or generated by inspectors. Where possible, the group will compare inspection result documentation with the instructions for specific inspection activities.

L.4/8. The programme referred to in paragraph L.4/4 above will continue. Also, efficient methods will be worked out for using, in the preparation of SIRs, those new types of information which are routinely gathered through inspections and have been recorded in computerized files for the first time this year.

L.4/9. Further safeguards effectiveness evaluation procedures will be devised, including procedures associated with the results of the long-term programme referred to in paragraph L.4/5 above. There will be particular emphasis on procedures deriving from the development of safeguards approaches and from diversion path analyses and leading to the setting of inspection goals.

## OUTLINE OF CHANGES DURING 1983–86

L.4/10. The activities described under "PLANS FOR 1981–82" will be extended to include the performance of all safeguards effectiveness evaluation functions, especially those relating to the determination of achieved confidence levels and achieved probabilities of detection.

## SUB-PROGRAMME L.5

### Standardization and administrative support

OBJECTIVE

L.5/1. The objective is:

(a) To continue standardization, in accordance with safeguards implementation policies adopted by the Department of Safeguards, in the formulation of subsidiary arrangements to safeguards agreements;
(b) To participate in the negotiation of subsidiary arrangements in order that the aim described in sub-paragraph (a) above can be achieved;
(c) To formulate and update administrative procedures relating to the application of safeguards; and
(d) To prepare non-technical reports, studies and manuals, to coordinate the flow of documents within the Department of Safeguards, to organize and operate the Departments's filing system, to compile operational statistics and to provide specialized administrative assistance to the Department.

RESULTS TO DATE

L.5/2. The preparation of model subsidiary arrangements, including facility attachments, has been completed for all types of facilities under routine safeguards. Actual subsidiary arrangements have been brought into conformity with the models.

PLANS FOR 1981–82

L.5/3. As the number of facilities subject to safeguards increases, the flow of information on safeguards implementation needs to be reviewed. The bringing of subsidiary arrangements already concluded into conformity with the latest standards will continue. Activities concerning the setting up of administrative procedures for the evaluation of safeguards results will also continue.

OUTLINE OF CHANGES DURING 1983–86

L.5/4. The magnitude of the task of implementing Agency safeguards is expected to increase to the point where a thorough review of the managerial approach will become indispensable. However, less rapid growth of the safeguards implementation workload will make it possible to predict manpower and related financial requirements more accurately. Generally, it is expected that the period 1982–85 will be one of consolidation and that the task of streamlining administrative procedures will acquire more importance.

## SUB-PROGRAMME L.6

### Safeguards training

OBJECTIVE

L.6/1. The objective is to arrange, using the expertise available within the Department of Safeguards and other Agency Departments, training for Agency safeguards inspectors and other staff of the Department of Safeguards and, where appropriate, for SSAC and other personnel of Member States in connection with the latters' obligations under safeguards agreements with the Agency; to prepare, or co-ordinate the preparation of, documentation required for training purposes; to provide training aids appropriate to the needs of the training programme; and to evaluate the results of training activities.

## RESULTS TO DATE

L.6/2. During 1979, training activities increased markedly and Member States, recognizing the importance of training, provided greatly increased facilities at their establishments. Over the past five years, 93 inspectors have taken the Agency's introductory course on safeguards and Member States have provided 180 places on courses for the practical training of inspectors.

L.6/3. Over 100 persons working for SSACs and other safeguards-related bodies in Member States have attended five Agency courses on SSACs. Elements of the SSAC course programme were incorporated in an extended safeguards workshop seminar held in September 1979.

L.6/4. Organizational measures taken within the Department of Safeguards to meet the growing need for training have included the establishment, early this year, of a Safeguards Training Unit.

## PLANS FOR 1981–82

L.6/5. Training activities will take into account the continuing development of safeguards strategies, methods and technologies, the aim being to provide seven-week induction training for new inspectors and two-week refresher and updating courses for long-standing members of the inspectorate.

L.6/6. The organization of the basic and advanced two-week SSAC training courses will continue.

## OUTLINE OF CHANGES DURING 1983–86

L.6/7. Increasing use will be made of visual aids in the design of self-teaching programmes aimed at facilitating the training of individual inspectors who, because of travel commitments, cannot participate in regular courses. Programmes will be developed for on-the-job training designed to enable inspectors to continue developing their skills in line with the increasing complexity of their tasks. A comprehensive programme of SSAC training for personnel from Member States is foreseen.

Co-ordinated research programmes

Table L.13

| Co-ordinated programme title | Number of | | Year initiated | Probable year of termination |
|---|---|---|---|---|
| | Contracts | Agreements | | |
| 1. Application of isotopic correlation techniques in international safeguards | – | 5 | 1975 | 1981 |
| 2. Use of installed instrumentation at fuel reprocessing facilities for safeguards purposes | 5 | 6 | 1977 | 1983 |
| 3. International safeguards in large-inventory critical assemblies | 1 | 2 | 1978 | 1983 |

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS
(TCs, AGs and consultants' meetings)

Table L.14

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1. | Internal reports with advice and recommendations relating to safeguards implementation | Director General and Department of Safeguards | SAGSI 1982/1, 2 and 1982/1, 2 Reports prepared immediately after each series of SAGSI meetings | Each year | L/15 |
| 2. | Report on types of instruments needed for improving safeguards containment and surveillance and on the best ways of developing and implementing them | Director General and Department of Safeguards | AG 1982/3 | 1983 | L.2/11 and L.2/10(a)-(e) |
| 3. | Report on NDA instrument needs and on the best ways of developing such instruments | Director General and Department of Safeguards | AG 1981/3 | 1981 | L.2/11 and L.2/10(f) and (g) |
| 4. | Report on spent fuel measurements by means of portable NDA instruments | Director General and Department of Safeguards | AG 1982/4 | 1982 | L.2/11 and L.2/10(f) |
| 5. | Report on safeguards instrumentation requirements at reprocessing facilities and ways of meeting those requirements | Director General and Department of Safeguards | AG 1981/4 | 1982 | L.2/11 and L.2/10(i) |
| 6. | Report on safeguards application to different types of fuel cycles | Director General and Department of Safeguards | AG 1982/5 | 1982 | L.2/14 and L.2/13(a) |
| 7. | Report with suggestions for developing and improving the methodology used in evaluating safeguards effectiveness | Director General and Department of Safeguards | AG 1981/5 | 1981 | L.2/14 and L.2/13(b) |
| 8. | Report with recommendations related to problems of safeguarding large-scale facilities such as enrichment, fuel fabrication and reprocessing plants | Director General and Department of Safeguards | AG 1981/6 | 1981 | L.2/14 and L.2/13(c) |
| 9. | Report with recommendations on dealing with problems of safeguarding facilities at which plutonium and highly enriched uranium are handled | Director General and Department of Safeguards | AG 1982/6 | 1982 | L.2/14 and L.2/13(c) |
| 10. | Report with detailed guidelines for the establishment and maintenance of SSACs | Director General and Department of Safeguards | AG 1981/7 | 1982 | L.2/14 and L.2/13(f) |
| 11. | Report with recommendations on particular aspects of SSAC operation | Director General and Department of Safeguards | AG 1982/7 | 1983 | L.2/14 and L.2/13(f) |
| 12. | Reports on evaluations of the quality of data resulting from analytical measurements made with non-destructive and destructive techniques | Director General and Department of Safeguards | AG 1981/8 and 1982/8 | 1981/82 | L.3/16 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriation and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1–2. | Standing Advisory Group on Safeguards Implementation (SAGSI) | L/15 |
| 3. | Advisory Group on non-destructive assay instruments and measurement technology | L.2/11 |
| 4. | Advisory Group on safeguards instrumentation for reprocessing facilities | L.2/11 |
| 5. | Advisory Group on methodology for safeguards effectiveness evaluation | L.2/14 |
| 6. | Advisory Group on safeguarding large-scale facilities (reprocessing, fuel fabrication, enrichment) | L.2/14 |
| 7. | Advisory Group on detailed guidelines on functioning and elements of SSACs | L.2/14 |
| 8. | Advisory Group on the evaluation of the quality of safeguards non-destructive assay measurements | L.3/16 |

| 1982 | | |
|---|---|---|
| 1–2. | Standing Advisory Group on Safeguards Implementation (SAGSI) | L/15 |
| 3. | Advisory Group on containment and surveillance instrumentation | L.2/11 |
| 4. | Advisory Group on spent fuel measurements | L.2/11 |
| 5. | Advisory Group on safeguards application for multiple facility nuclear fuel cycles | L.2/14 |
| 6. | Advisory Group on safeguarding nuclear facilities handling plutonium and highly enriched uranium | L.2/14 |
| 7. | Advisory Group on recommendations for SSACs | L.2/14 |
| 8. | Advisory Group on evaluation of the quality of safeguards analytical measurements | L.3/16 |

# M. INFORMATION AND TECHNICAL SERVICES

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table M.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 471 797 | 2 728 000 | 247 000 | 83 000 | 330 000 | 3 058 000 | 3 419 000 | 3 728 000 |
| Consultants | 4 869 | 16 700 | 600 | (8 300) | (7 700) | 9 000 | 16 000 | 17 600 |
| Overtime | 12 386 | 14 400 | 1 000 | (200) | 800 | 15 200 | 19 400 | 22 700 |
| Temporary assistance | 26 592 | 33 900 | 2 200 | (2 700) | (500) | 33 400 | 38 500 | 39 600 |
| Sub-total | 2 515 644 | 2 793 000 | 250 800 | 71 800 | 322 600 | 3 115 600 | 3 492 900 | 3 807 900 |
| Common staff costs | 754 253 | 791 000 | 117 000 | 25 000 | 142 000 | 933 000 | 1 059 900 | 1 155 700 |
| Travel | 25 213 | 26 400 | 3 700 | (100) | 3 600 | 30 000 | 41 000 | 45 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 4 350 | 20 000 | 3 000 | (2 000) | 1 000 | 21 000 | 23 000 | 25 000 |
| Technical committees, advisory groups | 40 351 | 38 000 | 5 000 | (1 000) | 4 000 | 42 000 | 65 000 | 44 000 |
| Representation and hospitality | 2 657 | 3 200 | 100 | – | 100 | 3 300 | 5 200 | 6 400 |
| Scientific and technical contracts | 46 309 | 33 500 | 2 500 | (4 000) | (1 500) | 32 000 | 86 000 | 94 000 |
| Common services, supplies and equipment | 3 153 756 | 3 083 400 | (256 600) | (238 300) | (494 900) | 2 588 500 | 2 900 000 | 3 171 500 |
| Other items of expenditure | 26 241 | 28 500 | 2 500 | (1 400) | 1 100 | 29 600 | 41 000 | 46 500 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 91 494 | 79 000 | 4 000 | 7 000 | 11 000 | 90 000 | 73 000 | 78 000 |
| Printing and publishing services | 904 282 | 974 000 | 120 000 | (59 000) | 61 000 | 1 035 000 | 1 066 000 | 1 176 000 |
| Data processing services | (3 491 106) | (3 445 000) | 112 000 | 105 000 | 217 000 | (3 228 000) | (3 759 000) | (4 115 000) |
| Conference services | – | 11 000 | 1 000 | 1 000 | 2 000 | 13 000 | 14 000 | 12 000 |
| TOTAL | 4 073 444 | 4 436 000 | 365 000 | (96 000) | 269 000 | 4 705 000 | 5 108 000 | 5 547 000 |

## SUMMARY OF MANPOWER

Table M.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 4 | 4 | 4 | 1 | 5 | 5 | 5 |
| P-4 | 11 | 11 | 11 | (1) | 10 | 11 | 12 |
| P-3 | 12 | 13 | 14 | 1 | 15 | 15 | 15 |
| P-2 | 3 | 4 | 5 | (1) | 4 | 5 | 5 |
| P-1 | 3 | 2 | 2 | – | 2 | 2 | 2 |
| Sub-total | 34 | 35 | 37 | – | 37 | 39 | 40 |
| GS | 77 | 79 | 79 | 1 | 80 | 84 | 85 |
| TOTAL | 111 | 114 | 116 | 1 | 117 | 123 | 125 |

## CHANGES IN COSTS AND MANPOWER

### Costs

M/1. As will be seen from Table M.1 above, it is expected that the cost of this programme will increase by $269 000 as a net result of salary and other price increases of $365 000 partly offset by a programme decrease of $ 96 000.

M/2. The programme increase of $108 000 in respect of salaries for established posts and common staff costs is attributable to the transfer of two Professional posts to the "Computer services" sub-programme in the adjusted manning table for 1980 and to the addition of one GS post in the Director's Office for an administrative assistant in 1981. The programme decrease in the "Scientific journals" sub-programme reflects the transfer of one GS post the the "Computer services" sub-programme as a result of the decision to discontinue publication of the journal Atomic Energy Review.

M/3. Programme decreases are foreseen in respect of consultants' services ($8 300, primarily in the "INIS" and "Computer services" sub-programmes), overtime and temporary assistance ($2 900). Although the same number of meetings is planned for 1981 as for 1980, a programme decrease is foreseen in respect of conferences, symposia and seminars ($2 000) and technical committees and advisory groups ($1 000). The programme decrease of $4 000 in respect of scientific and technical contracts is the net result of increases in the "INIS" and decreases in the "Computer services" and "Scientific journals" sub-programmes. The latter is related to the discontinuing of Atomic Energy Review. Programme decreases in respect of common services, supplies and equipment ($238 300) relate to all sub-programmes, but mainly the "Computer services" sub-programme. The programme decrease in respect of other items of expenditure ($1 400) represents mainly a reduction in staff training under the "Computer services" sub-programme.

M/4. With regard to the allocation of service costs, a programme decrease of $59 000 is foreseen in respect of printing and publishing services, mainly in respect of the "INIS" and "Scientific journals" sub-programmes. Programme increases are foreseen in respect of linguistic services ($7 000) and conference services ($1 000). Of the $105 000 which appear in Table L.1 as a programme increase in respect of data processing services, $56 000 represent a programme decrease in data processing service costs transferred to other programmes, as can be seen from Table M.7. A real programme increase in respect of data processing services is required for the Library; it is partly offset by a programme decrease in respect of INIS.

M/5. It is expected that income from INIS publications will be $340 000 in 1981.

## Costs of the Office of the Director

### Table M.3

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 79 643 | 84 000 | 8 000 | 13 000 | 21 000 | 105 000 | 112 000 | 120 000 |
| Sub-total | 79 643 | 84 000 | 8 000 | 13 000 | 21 000 | 105 000 | 112 000 | 120 000 |
| Common staff costs | 45 908 | 23 800 | 4 000 | 4 000 | 8 000 | 31 800 | 34 800 | 36 700 |
| Travel | 6 608 | 2 300 | 300 | – | 300 | 2 600 | 5 000 | 5 600 |
| Representation and hospitality | 372 | 400 | – | – | – | 400 | 600 | 700 |
| Scientific and technical contracts | 218 | – | – | – | – | – | – | – |
| Common services, supplies and equipment | – | 3 500 | – | (2 300) | (2 300) | 1 200 | 1 600 | 2 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 110 | – | – | – | – | – | – | – |
| Printing and publishing services | 179 313 | 4 000 | – | 1 000 | 1 000 | 5 000 | 5 000 | 6 000 |
| TOTAL | 312 172 | 118 000 | 12 300 | 15 700 | 28 000 | 146 000 | 159 000 | 171 000 |

## Costs of scientific journals

Table M.4

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 85 606 | 101 000 | 10 000 | (9 000) | 1 000 | 102 000 | 107 000 | 113 000 |
| Consultants | – | 2 100 | 300 | 2 900 | 3 200 | 5 300 | 6 000 | 6 300 |
| Temporary assistance | – | 1 800 | 100 | (100) | – | 1 800 | 2 000 | 2 100 |
| Sub-total | 85 606 | 104 900 | 10 400 | (6 200) | 4 200 | 109 100 | 115 000 | 121 400 |
| Common staff costs | 4 534 | 29 700 | 4 200 | (3 000) | 1 200 | 30 900 | 33 000 | 35 000 |
| Travel | – | 400 | – | – | – | 400 | 1 000 | 1 400 |
| Representation and hospitality | – | 300 | – | – | – | 300 | 600 | 700 |
| Scientific and technical contracts | 18 200 | 18 500 | 1 500 | (10 000) | ( 8 500) | 10 000 | 11 000 | 12 000 |
| Common services, supplies and equipment | 33 | 1 200 | 100 | – | 100 | 1 300 | 1 400 | 1 500 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 87 032 | 60 000 | 3 000 | 4 000 | 7 000 | 67 000 | 47 000 | 50 000 |
| Printing and publishing services | 186 155 | 338 000 | 41 000 | (18 000) | 23 000 | 361 000 | 288 000 | 320 000 |
| Data processing services | – | 4 000 | – | 1 000 | 1 000 | 5 000 | 5 000 | 5 000 |
| TOTAL | 381 560 | 557 000 | 60 200 | (32 200) | 28 000 | 585 000 | 502 000 | 547 000 |

## Costs of INIS activities

Table M.5

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 848 693 | 986 000 | 82 000 | – | 82 000 | 1 068 000 | 1 162 000 | 1 245 000 |
| Consultants | 4 869 | 7 900 | 300 | (6 100) | (5 800) | 2 100 | 3 000 | 3 300 |
| Overtime | 1 185 | 600 | 100 | 800 | 900 | 1 500 | 1 600 | 1 700 |
| Temporary assistance | 13 445 | 12 800 | 700 | (4 400) | (3 700) | 9 100 | 13 000 | 16 000 |
| Sub-total | 868 192 | 1 007 300 | 83 100 | (9 700) | 73 400 | 1 080 700 | 1 179 600 | 1 266 000 |
| Common staff costs | 258 799 | 285 900 | 39 900 | – | 39 900 | 325 800 | 360 400 | 386 000 |
| Travel | 10 923 | 11 600 | 1 700 | – | 1 700 | 13 300 | 20 000 | 22 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 4 350 | 20 000 | 3 000 | (2 000) | 1 000 | 21 000 | 23 000 | 25 000 |
| Technical committees, advisory groups | 40 351 | 38 000 | 5 000 | (1 000) | 4 000 | 42 000 | 65 000 | 44 000 |
| Representation and hospitality | 2 285 | 2 500 | 100 | – | 100 | 2 600 | 4 000 | 5 000 |
| Scientific and technical contracts | 8 651 | – | – | 10 000 | 10 000 | 10 000 | 21 000 | 22 000 |
| Common services, supplies and equipment | 232 185 | 236 300 | 28 700 | (15 000) | 13 700 | 250 000 | 303 000 | 318 000 |
| Other items of expenditure | 3 071 | 2 400 | 200 | – | 200 | 2 600 | 4 000 | 4 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 4 352 | 18 000 | 1 000 | 2 000 | 3 000 | 21 000 | 25 000 | 27 000 |
| Printing and publishing services | 519 403 | 597 000 | 76 000 | (49 000) | 27 000 | 624 000 | 725 000 | 800 000 |
| Data processing services | 721 897 | 791 000 | (25 000) | (27 000) | (52 000) | 739 000 | 745 000 | 850 000 |
| Conference services | – | 11 000 | 1 000 | 1 000 | 2 000 | 13 000 | 14 000 | 12 000 |
| TOTAL | 2 674 459 | 3 021 000 | 214 700 | (90 700) | 124 000 | 3 145 000 | 3 489 000 | 3 781 000 |

## Costs of the Library

Table M.6

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 324 575 | 327 000 | 36 000 | – | 36 000 | 363 000 | 431 000 | 465 000 |
| Consultants | – | – | – | 1 600 | 1 600 | 1 600 | 2 000 | 2 000 |
| Overtime | 117 | 1 200 | 100 | (600) | (500) | 700 | 800 | 1 000 |
| Temporary assistance | 404 | 7 600 | 400 | (1 500) | (1 100) | 6 500 | 6 500 | 6 500 |
| Sub-total | 325 096 | 335 800 | 36 500 | (500) | 36 000 | 371 800 | 440 300 | 474 500 |
| Common staff costs | 99 077 | 95 000 | 15 900 | – | 15 900 | 110 900 | 133 700 | 144 500 |
| Travel | 853 | 2 100 | 300 | (100) | 200 | 2 300 | 3 000 | 3 500 |
| Common services, supplies and equipment | 205 703 | 247 000 | 24 000 | (70 000) | (46 000) | 201 000 | 237 000 | 270 000 |
| Other items of expenditure | – | 1 100 | 100 | (200) | (100) | 1 000 | 1 000 | 1 500 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | – | 1 000 | – | 1 000 | 1 000 | 2 000 | 1 000 | 1 000 |
| Printing and publishing services | 11 096 | 22 000 | 2 000 | 6 000 | 8 000 | 30 000 | 32 000 | 33 000 |
| Data processing services | 63 428 | 36 000 | (1 000) | 75 000 | 74 000 | 110 000 | 110 000 | 120 000 |
| TOTAL | 705 253 | 740 000 | 77 800 | 11 200 | 89 000 | 829 000 | 958 000 | 1 048 000 |

## Costs of computer services

Table M.7

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 1 133 280 | 1 230 000 | 111 000 | 79 000 | 190 000 | 1 420 000 | 1 607 000 | 1 785 000 |
| Consultants | – | 6 700 | – | (6 700) | (6 700) | – | 5 000 | 6 000 |
| Overtime | 11 084 | 12 600 | 800 | (400) | 400 | 13 000 | 17 000 | 20 000 |
| Temporary assistance | 12 743 | 11 700 | 1 000 | 3 300 | 4 300 | 16 000 | 17 000 | 15 000 |
| Sub-total | 1 157 107 | 1 261 000 | 112 800 | 75 200 | 188 000 | 1 449 000 | 1 646 000 | 1 826 000 |
| Common staff costs | 345 935 | 356 600 | 53 000 | 24 000 | 77 000 | 433 600 | 498 000 | 553 500 |
| Travel | 6 829 | 10 000 | 1 400 | – | 1 400 | 11 400 | 12 000 | 12 500 |
| Scientific and technical contracts | 19 240 | 15 000 | 1 000 | (4 000) | (3 000) | 12 000 | 54 000 | 60 000 |
| Common services, supplies and equipment | 2 715 835 | 2 595 400 | (309 400) | (151 000) | (460 400) | 2 135 000 | 2 357 000 | 2 580 000 |
| Other items of expenditure | 23 170 | 25 000 | 2 200 | (1 200) | 1 000 | 26 000 | 36 000 | 41 000 |
| Transfer of costs: | | | | | | | | |
| Printing and publishing services | 8 315 | 13 000 | 1 000 | 1 000 | 2 000 | 15 000 | 16 000 | 17 000 |
| Data processing services | ( 4 276 431) | (4 276 000) | 138 000 | 56 000 | 194 000 | (4 082 000) | (4 619 000) | (5 090 000) |
| TOTAL | – | – | – | – | – | – | – | – |

## Manpower

M/6. As will be seen from Table M.2 above, two Professional posts are transferred from another programme in the adjusted manning table for 1980. These two Professional posts and one GS post from the "Scientific journals" sub-programme are assigned to the "Computer services" sub-programme. In 1981 one additional GS post is required for the Director's Office; also, the upgrading of two Professional posts is foreseen. Detailed justifications are provided in Annex IV.

M/7. For 1982 it is foreseen that one additional GS post will be required for INIS, one P-2 post and one GS post for the Library, and one P-4 post and two GS posts for the "Computer services" sub-programme. For 1983 it is expected that one additional P-4 post and one GS post will be needed.

Computer services: Breakdown of costs by programme

Table M.8

| | 1979 Actual obligations | 1980 Adjusted budget | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|
| Allocated to other programmes: | | | | | |
| Technical assistance | 36 361 | 70 000 | 65 000 | 80 000 | 70 000 |
| Nuclear power | 140 816 | 175 000 | 80 000 | 89 000 | 106 000 |
| Nuclear fuel cycle | – | 35 000 | 30 000 | 37 000 | 44 000 |
| Nuclear safety | 2 224 | 15 000 | 22 000 | 31 000 | 37 000 |
| Food and agriculture | 10 112 | 32 000 | 42 000 | 45 000 | 50 000 |
| Life sciences | 2 497 | 3 000 | 2 000 | 2 000 | 2 000 |
| Physical sciences | 136 489 | 202 000 | 130 000 | 160 000 | 240 000 |
| The Laboratory | 25 379 | 26 000 | 20 000 | 40 000 | 50 000 |
| Safeguards | 1 978 723 | 2 389 000 | 2 361 000 | 2 546 000 | 2 735 000 |
| Executive management and technical programme planning | 425 | – | – | – | – |
| Administration | 448 927 | 420 000 | 375 000 | 613 000 | 657 000 |
| General services | 24 777 | 21 000 | 28 000 | 35 000 | 48 000 |
| Service activities | 37 568 | 57 000 | 73 000 | 81 000 | 76 000 |
| Sub-total, allocated data processing services (see Table M.1) | 2 844 298 | 3 445 000 | 3 228 000 | 3 759 000 | 4 115 000 |
| Remaining as a charge to the programme Information and technical services: | | | | | |
| Scientific journals | – | 4 000 | 5 000 | 5 000 | 5 000 |
| INIS | 721 897 | 791 000 | 739 000 | 745 000 | 850 000 |
| Library | 63 428 | 36 000 | 110 000 | 110 000 | 120 000 |
| TOTAL, data processing services for the Agency (see Table M.7) | 3 629 623 | 4 276 000 | 4 082 000 | 4 619 000 | 5 090 000 |

## Summary of manpower by organization unit and category

Table M.9

| Organization unit | 1979 Adjusted budget | | | 1980 Adjusted budget | | | 1981 Estimate | | | 1982 Preliminary estimate | | | 1983 Preliminary estimate | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | GS | Total | P | GS | Total | P | GS | Total | P | GS | Total | P | GS | Total |
| Office of the Director | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| Scientific journals | 1 | 4 | 5 | 1 | 3 | 4 | 1 | 3 | 4 | 1 | 3 | 4 | 1 | 3 | 4 |
| INIS Section | 14 | 24 | 38 | 14 | 24 | 38 | 14 | 24 | 38 | 14 | 25 | 39 | 14 | 25 | 39 |
| Library | 4 | 10 | 14 | 4 | 10 | 14 | 4 | 10 | 14 | 5 | 11 | 16 | 5 | 11 | 16 |
| Computer Section | 14 | 38 | 52 | 17 | 41 | 58 | 17 | 41 | 58 | 18 | 43 | 61 | 19 | 44 | 63 |
| TOTAL | 34 | 77 | 111 | 37 | 79 | 116 | 37 | 80 | 117 | 39 | 84 | 123 | 40 | 85 | 125 |

## THE PROGRAMME

### OBJECTIVE

M/8. The objective is to foster the exchange of scientific and technical information on peaceful uses of atomic energy by assembling such information and disseminating it to Member States, Agency staff and interested international organizations and to provide library and computer support to all organizations located in the Vienna International Centre.

### STRUCTURE

M/9. This programme consists of four sub-programmes, which are described in the following paragraphs.

*(see Table M.9)*

## SUB-PROGRAMME M.1

## INIS

### OBJECTIVE

M.1/1. The objective is to operate and further develop a comprehensive nuclear information and abstracting service involving the processing of input received from Member States, the provision of output in a variety of forms to Member States for dissemination on a national basis and the provision of assistance to Member States to help them in improving their methods of information handling and in gaining more rapid access to nuclear information sources.

### RESULTS TO DATE

M.1/2. Sixty-two Member States and 13 international organizations are now participating in INIS and their combined input exceeds 75 000 published items a year. At the end of 1979, the INIS bibliographic file had grown to 495 000 items. In addition, the "library" of publications (reports, standards, patents, theses, etc.) available in microfiche form from the INIS Clearinghouse had risen to 120 000 documents. The scope of the INIS data base was expanded in 1979 to encompass medical applications. The in-depth coverage of the nuclear safety literature was also examined and strengthened. The INIS Atomindex has thus since mid-1976 been the announcement and abstract journal for the world's literature in nuclear science and technology with about 1400 subscribers.

M.1/3. The INIS data processing involves the use of the latest techniques, such as optical character recognition, computer-driven photocomposition and on-line data entry and correction. Recent system efforts aim to provide all interested Member States with direct on-line access to the INIS data base and other searchable files stored on the Agency's computer. By the end of 1979, ten Member States were able to participate in this fashion, with more participants expected in 1980.

M.1/4. The INIS centres in participating Member States are responsible for providing national nuclear information services using the products of the system (INIS magnetic tapes, INIS Atomindex and INIS microfiches). Thus, the existence of INIS has induced countries to develop their own capabilities for disseminating information and to build up national information structures in accordance with local conditions and needs. To assist Member States in developing the specialized manpower required, INIS has conducted regular training seminars, made available opportunities for fellows and other trainees to receive training at the Agency's Headquarters and provided a technical advisory service for national information centres. Almost 500 people, many of them from developing countries, have undergone some form of INIS training since the system started operating.

M.1/5. In 1979, the Third Advisory Committee for INIS reviewed the operation of the programme and provided advice on future developments.

M.1/6. The identification and classification of data (data flagging) within the documents indexed by the INIS system is still in its formative stages. A small Technical Committee in 1980 ascertained what modifications needed to be made to the input guidelines.

PLANS FOR 1981–82

M.1/7. The principal activity of INIS will be the maintenance of the INIS bibliographic data base and the provision of output products to Member States every two weeks. It is expected that this activity will increase in scale (the input level for 1979 was 25% above that for 1976). More computer-derived services will be provided and the quantity of microfiche distribution will increase. User studies will be conducted to identify new product and service requirements and pinpoint system strengths and weaknesses.

M.1/8. Connections to other networks (for example, the European Space Agency Network and TYMNET) will considerably expand the number of Member States directly accessing the INIS data base in 1981–82 and will permit INIS to better evaluate data base utilization. This will enable INIS to maintain a leading role among international information systems.

M.1/9. Experiments in computer-assisted input conversion will be conducted to assess the feasibility of direct input over telecommunications lines and to facilitate initial input preparation by Member States in their mother tongues. The results will be assessed by a Technical Committee (Table M.10, No.1).

M.1/10. In co-operation with Member States, a multilingual dictionary or thesaurus pertinent to the INIS scope will be developed; this will be of benefit to indexers and retrieval specialists in Member States and will assist the maintenance of the official English language version of the INIS Thesaurus by the Secretariat. A Technical Committee of experts from those Member States who have prepared non-English Thesaurus versions met in late 1979 to consolidate experience and outline the work for 1981–82. Achievements in 1981–82 will be subsequently assessed by another Technical Committee (Table M.10, No.1).

M.1/11. The necessary changes and improvements will be introduced to make the data flagging programme fully operational.

M.1/12. The practice of making a regular review of selected system features to improve coverage and timeliness and increase usefulness will continue. Technical Committees will meet in 1981 and 1982 in this regard to help establish direct input practices, assess data flagging practices and devise new co-operative modes of output utilization (Table M.10, No.1).

M.1/13. Comprehensive INIS Training Seminars will be held in 1981 and 1982 (Annex I (18) and II (17)). The purpose is to help increase the speed and scope of INIS input capture and to enhance information system infrastructures in Member States. In addition, workshop or small seminar-type courses involving the travel of INIS Professional staff to user sites will be arranged in order to provide training on INIS on-line access. The co-operation with AGRIS in this training programme will continue.

M.1/14. A series of training publications and aids will be prepared in order to meet the growing training needs of Member States, especially those which are developing countries.

M.1/15. Annual meetings of the INIS Liaison Officers will continue; these meetings are essential for INIS communications with Member States on policy and total system development. In accordance with suggestions at the 1979 meeting, consideration is being given to holding future sessions in a Member State in alternate years (Table M.10, No.2).

M.1/16. The achievements and the future programme of INIS will be reviewed by the Fourth Advisory Committee in 1982 (Table M.10, No.3).

RELATED ACTIVITIES

M.1/17. As one of the leading world-wide information systems, INIS has been asked to give advice and to participate in the formulation of international standards for information processing. Its obligations in this area will continue, particularly in the light of its increasing networking experience.

## OUTLINE OF CHANGES DURING 1983–86

M.1/18. Further development of the INIS system will be oriented towards facilitating the transfer of technology in the nuclear field by providing greater coverage and a quicker service. It is planned to arrange for access to other appropriate international networks established in the future.

M.1/19. In the 1983–86 period it is expected that information system networks will become very widespread. A variety of bibliographic and numeric data bases will be available on these networks for on-line utilization by the world's scientific community. As a result of the experiments and operations conducted in 1979–81, INIS will be fully represented in these international networks.

M.1/20. Technological improvements in computer and associated hardware will permit a greater information service capability at both centralized, international and decentralized, national levels. For example, mass storage devices will permit economical recording of the entire contents of documents. Improvements in facsimile are also expected. User requests for copies could thus be met by "electronic mail" as well as by conventional reprographic techniques. More and more national information centres will be able to afford and operate small-scale computer systems to provide information services custom-tailored to their users. These expanded capabilities will increase the demand for INIS output products.

## CO-OPERATION WITH OTHER ORGANIZATIONS

M.1/21. In addition to the close co-operation required between the INIS Secretariat and INIS centres in Member States, significant co-operation will also be maintained with other bodies: ESA (European Space Agency), CEC and IIASA on networking; IOB (Inter-Organization Board for Information Systems), ICSU-AB (Abstracting Board) and UNESCO on directories and information processing concepts; ISO on information standards; and NEA and FAO on data base maintenance.

# SUB-PROGRAMME M.2

## Library

## OBJECTIVE

M.2/1. With the establishment of the VIC Library under the general direction of the IAEA, the main objective is now to provide the Secretariats and Member States of the organizations located at the Vienna International Centre with full library-based information, reference and document delivery services by acquiring, maintaining and disseminating a comprehensive collection of literature covering the various aspects of the Secretariats' activities.

## RESULTS TO DATE

M.2/2. A full range of library-based information services has been provided to members of the Secretariat, Member States and members of Missions. A continued strengthening of links and common policies with the UNIDO Library was undertaken in preparation for the merger. A series of consultations resulted in agreement on co-ordinated cataloguing policies and practices, shared SDI (selective dissemination of information) services, joint reference services, complementary acquisition policies and an expanded training programme.

M.2/3. An on-line data base has been developed to include the holdings of both UNIDO and IAEA Libraries. The system is closely linked with INIS and enables researchers to make use of new effective automated methodologies in searching the literature available to them through the Library.

M.2/4. The two libraries have been merged physically and a single access/information/control point for users and materials has been provided.

PLANS FOR 1981–82

M.2/5. Library automation will gradually be extended to cover management and service activities; this refers in particular to the book and serial acquisition programme, the SDI and Current Awareness Services, the preparation of specialized bibliographies and subject lists, and literature searches on both internally created and external, commercial data bases.

M.2/6. It is planned to expand the collection (by acquisition) and the inter-library loan service in order to make materials available to the VIC staff in fields not previously included in the IAEA or UNIDO subject scopes. This collection development will necessitate close co-operation with staff of the various specialized United Nations groups, e.g. those concerned with drug abuse, crime prevention, social welfare for the handicapped and so on.

M.2/7. A new system of indexing and abstracting library material will be developed to provide greater coverage of the collection.

M.2/8. The library material from the European Community's regional economic commissions will be expanded by closer co-operation with these bodies.

M.2/9. The previous UNIDO Library participation in a group of libraries sharing a common system and covering similar subject areas will be strengthened and arrangements will be made for the exchange of data bases and of microfiche catalogues with such organizations as UNESCO, ILO and the International Development Research Centre (IDRC), Canada.

OUTLINE OF CHANGES DURING 1983–86

M.2/10. As the collection grows, services to VIC staff will be expanded. This should not necessitate a proportionate cost increase, as greater use will be made of microfiche, and the data base should then be sufficiently developed to be exchanged with other United Nations and non-governmental organization data bases.

M.2/11. Direct computer access by outside users via TYMNET and/or leased lines in conjunction with inexpensive microfiching facilities will appreciably reduce the time for document delivery and will bring the world's literature within easy reach of not only VIC staff but also of field staff in remote regions.

M.2/12. It is envisaged that the training programme will be further developed to permit regular internships for trainees from Member States.

CO-OPERATION WITH OTHER ORGANIZATIONS

M.2/13. As a result of the broadening of the subject areas covered by the Library, there will be greatly increased co-operation with the libraries of ILO, WHO, FAO, UNEP and the United Nations in Geneva and New York. Closer collaboration will also be maintained with international library associations and especially with the national libraries of Member States in co-ordinating efforts for the training of information personnel, especially those from developing countries.

## SUB-PROGRAMME M.3

### Computer services

OBJECTIVE

M.3/1. The objective is to provide timely and effective data processing support to the IAEA and to the various United Nations organizations at the Vienna International Centre. This includes systems analysis and design, programming, technical support and training to computer and word processor users, data entry services and special studies, the development and operation of efficient computer facilities capable of satisfying the overall data processing requirements and the provision of effective co-ordination and technical support to all local computer processors located outside the main computer facility.

RESULTS TO DATE

M.3/2. Since 1975 there has been a dramatic increase in the use of computer services within the Agency. The computer facility has expanded from a middle-size IBM 370/145, through an IBM 370/158 to the present very large IBM 3032 (which was installed in December 1978). The first computer terminal was put into service in mid-1975 and more than 100 terminals are now in operation. Initially INIS was the largest user, but processing for Safeguards now accounts for 50% of the total time. To make it possible to enter jobs remotely, five Remote Job Entry Stations have been installed and connected to the computer. Program development and data entry are now carried out mainly through terminals instead of with punched cards. Since 1978, ten Member States using their own terminals have been able to access the computer via dial-up connections for retrieval of nuclear information stored in the INIS system.

M.3/3. The Agency's computer facility provides a service to UNRWA and UNIDO, which do not have computers of their own.

PLANS FOR 1981–82

M.3/4. A new computerized system for Technical Assistance will be implemented. This system will provide accurate and up-to-date status reports on all on-going projects.

M.3/5. It is expected that the volume of services to other United Nations organizations at the VIC will continue to increase.

M.3/6. The use of distributed processing (local processors) will be increased.

M.3/7. A significant expansion will be made in the use of word processing equipment and terminals.

M.3/8. Communication links will be made available to many more Member States to allow access to Agency data bases.

M.3/9. Experiments with satellite communication links for data transmission will be performed in connection with the development of distributed data base techniques for the continued improvement of the INIS programme.

M.3/10. Depending upon requirements, training in various computer areas will be provided for personnel from Member States.

OUTLINE OF CHANGES DURING 1983–86

M.3/11. The use of electronic mail and filing systems will be studied for possible administrative cost savings.

M.3/12. Facilities will be introduced to enable safeguards inspectors to access the Agency's computer from field locations.

CO-OPERATION WITH OTHER ORGANIZATIONS

M.3/13. Co-operation with the International Computing Centre (ICC) at Geneva and with selected computer centres of other United Nations organizations will be continued.

## SUB-PROGRAMME M.4

### Scientific journals

OBJECTIVE

M.4/1. The objectives are, through publication of Nuclear Fusion , to present and disseminate international scientific information on controlled thermonuclear fusion and technology relevant to fusion reactor concepts, thus

promoting co-operation among nations trying to obtain useful power from the controlled fusion of light nuclei; and to report on the Agency programmes in plasma physics and engineering, reactor technology, as well as relevant aspects of nuclear and atomic physics, chemistry and environment that are intended to facilitate the practical utilization of fusion power.

## RESULTS TO DATE

M.4/2. Since 1975, the interest shown in Nuclear Fusion has been steadily increasing; scientists from more than 60 laboratories in 16 Member States publish in the journal, which, in spite of its high manuscript rejection rate of approximately 50%, has grown in size by about 60% compared to 1975.

M.4/3. Owing to the change of publication frequency from bi-monthly to monthly in 1978, the revision of distribution and pricing policy and the introduction of a two-tier price structure to encourage wider circulation of the journal, subscriptions have increased about 20% since 1977.

M.4/4. Since 1975, the Nuclear Fusion supplementary programme has published the tabulated compilation entitled "World Survey of Major Facilities in Inertial Confinement Experiments" (which was undertaken on the advice of the IFRC) and the 1976 edition of the "World Survey of Major Facilities in Controlled Fusion Research". In view of the recent widespread and rapid progress in fusion, the scope of the 1980 edition has been expanded and the title changed to "World Survey of Major Activities in Controlled Fusion Research".

M.4/5. The scope of Nuclear Fusion has been expanded to cover fusion technology.

M.4/6. Preparation of a Fusion Thesaurus has started and the cost-free services of outside specialists have been secured. The first co-ordinating consultants' meeting is to be held in 1980.

M.4/7. The Atomic Energy Review has continued publication of critical reviews and surveys on all aspects of the peaceful uses of atomic energy. During the period 1975–79, scientists from 77 laboratories in 21 Member States, including eight developing countries, published critical evaluated information in the journal.

M.4/8. Two further special issues of Atomic Energy Review on the physico-chemical properties of the compounds and alloys of selected elements have been published, covering molybdenum and hafnium. Work has been started on a volume dealing with titanium.

## PLANS FOR 1981–82

M.4/9. Nuclear Fusion will continue to be published regularly.

M.4/10. The Fusion Thesaurus will be completed, published and disseminated upon approval by the consultants group at the end of 1982 (Table M.10, No.4).

M.4/11. Since the objectives of Atomic Energy Review can now be achieved through various other publications, issue of the journal by the Agency will cease at the end of 1980.

## OUTLINE OF CHANGES DURING 1983–86

M.4/12. As fusion activities expand and progress, consideration will be given to the idea of publishing Nuclear Fusion in two series, one devoted to theoretical and experimental work and to general fusion reactor concepts, and the other to fusion technology and engineering problems.

## CO-OPERATION WITH OTHER ORGANIZATIONS

M.4/13. For Nuclear Fusion, there is close co-operation with the IFRC and the plasma physics documentation centres at Garching (Federal Republic of Germany) and Culham (United Kingdom).

## SUMMARY OF PROGRAMME PRODUCTS RESULTING FROM MEETINGS

(TCs, AGs and consultants' meetings)

Table M.10

| No. | Product | Users | Schedule | Year of issue | Paragraph |
|---|---|---|---|---|---|
| 1 | Reports on new or revised procedures for system input, processing and output utilization | INIS Secretariat and National Centres | TC 1981/1 and 1982/1 | 1982 | M.1/9, M.1/10, M.1/12 |
| 2 | Review reports on total INIS system operation and policies | INIS Secretariat and Member States | Consultative meetings of INIS Liaison Officers [1981/2, 1982/2] | 1981 and 1982 | M.1/15 |
| 3 | Report on achievements and future orientation of INIS | IAEA Secretariat and the Director General | AG 1982/3 | 1982 | M.1/16 |
| 4 | Fusion Thesaurus | International fusion research community | Consultants' meeting in 1982 | 1982 | M.4/10 |

## TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1981–82

Within the limits of the appropriations and subject to the requirements of the programme as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Technical Committee on INIS input/output procedures | M.1/9,10,12 |
| 2. | Ninth consultative meeting of INIS Liaison Officers | M.1/15 |
| **1982** | | |
| 1. | Technical Committee on INIS input/output procedures | M.1/9,10,12 |
| 2. | Tenth consultative meeting of INIS Liaison Officers | M.1/15 |
| 3. | Fourth Advisory Committee for INIS | M.1/16 |

# N. POLICY-MAKING ORGANS

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table N.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 173 219 | 197 000 | 14 000 | – | 14 000 | 211 000 | 225 000 | 238 000 |
| Overtime | 6 072 | 31 500 | 2 100 | (3 000) | (900) | 30 600 | 32 000 | 34 000 |
| Temporary assistance | 1 596 | 15 200 | 1 000 | 5 200 | 6 200 | 21 400 | 23 000 | 24 000 |
| Sub-total | 180 887 | 243 700 | 17 100 | 2 200 | 19 300 | 263 000 | 280 000 | 296 000 |
| Common staff costs | 52 875 | 57 100 | 6 900 | – | 6 900 | 64 000 | 70 000 | 74 000 |
| Travel | – | 800 | – | (800) | (800) | – | – | – |
| Meetings | | | | | | | | |
| *Interpretation for sessions* | 88 019 | 85 000 | 10 000 | – | 10 000 | 95 000 | 100 000 | 106 000 |
| Common services, supplies and equipment | 122 319 | 183 200 | 15 000 | (47 200) | (32 200) | 151 000 | 158 000 | 166 000 |
| Other items of expenditure | 55 684 | 55 200 | 3 800 | – | 3 800 | 59 000 | 63 000 | 66 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 891 892 | 1 402 000 | 90 000 | (21 000) | 69 000 | 1 471 000 | 1 511 000 | 1 551 000 |
| Printing and publishing services | 240 475 | 502 000 | 59 000 | (49 000) | 10 000 | 512 000 | 499 000 | 530 000 |
| Conference services | – | 63 000 | 5 000 | – | 5 000 | 68 000 | 73 000 | 70 000 |
| TOTAL | 1 632 151 | 2 592 000 | 206 800 | (115 800) | 91 000 | 2 683 000 | 2 754 000 | 2 859 000 |

### Distribution of costs between the General Conference and the Board: Table N.2

| Organ | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| General Conference | 698 082 | 967 000 | 77 800 | (7 800) | 70 000 | 1 037 000 | 1 107 000 | 1 146 000 |
| Board of Governors | 934 069 | 1 625 000 | 129 000 | (108 000) | 21 000 | 1 646 000 | 1 647 000 | 1 713 000 |
| TOTAL | 1 632 151 | 2 592 000 | 206 800 | (115 800) | 91 000 | 2 683 000 | 2 754 000 | 2 859 000 |

## SUMMARY OF MANPOWER

Table N.3

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-2 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| Sub-total | 3 | 3 | 3 | – | 3 | 3 | 3 |
| GS | 2 | 2 | 2 | – | 2 | 2 | 2 |
| TOTAL | 5 | 5 | 5 | – | 5 | 5 | 5 |

## CHANGES IN COSTS

N/1. As will be seen from Table N.1 above, the cost of this programme is expected to increase by $91 000 as a net result of salary and other price increases of $206 800 partly offset by a programme decrease of $115 800.

N/2. A programme increase of $5 200 in respect of temporary assistance for the General Conference is partly offset by a programme decrease in respect of overtime for the Board of Governors ($3 000) and travel ($800). A programme decrease is also expected in respect of common services and supplies ($47 200), primarily for the meetings of the Board of Governors.

N/3. With regard to the allocation of service costs, programme decreases are foreseen in respect of linguistic services ($21 000) and printing and publishing services ($49 000).

## THE PROGRAMME

N/4. The responsibility for providing the services required by the Policy-making Organs of the Agency, namely the General Conference and the Board of Governors, is shared by the Secretariat of the Policy-making Organs, which undertakes the organizational and administrative work involved, and three Divisions in the Agency's Secretariat. The Division of Languages translates documents and prepares records of proceedings; the Division of Publications reproduces and circulates the documents; and the Division of External Relations provides the conference and interpretation facilities and services needed for the meetings of the two organs and their committees. In all work concerning the General Conference and the Board of Governors, the Secretariat of the Policy-making Organs reports to the Director General. Certain matters related to internal administration are co-ordinated with the Head of the Department of Administration.

N/5. It is planned to provide these services throughout the period 1981–86 on the same lines as in the past, introducing such improvements as prove to be desirable in the light of further experience and the changing requirements of the Policy-making Organs themselves.

# O. EXECUTIVE MANAGEMENT AND TECHNICAL PROGRAMME PLANNING

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table O.1

| Item of expenditure | *1979* Actual obligations | *1980* Adjusted budget | *Increase or (decrease) from 1980* | | | 1981 Estimate | *1982* Preliminary estimate | *1983* Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 859 151 | 958 000 | 77 000 | (9 000) | 68 000 | 1 026 000 | 1 082 000 | 1 143 000 |
| Consultants | 80 848 | 98 800 | 8 800 | (2 700) | 6 100 | 104 900 | 112 000 | 117 400 |
| Overtime | 9 339 | 13 300 | 700 | (1 200) | (500) | 12 800 | 14 500 | 15 500 |
| Temporary assistance | 9 739 | 6 500 | – | (6 500) | (6 500) | – | 2 000 | 2 200 |
| Sub-total | 959 077 | 1 076 600 | 86 500 | (19 400) | 67 100 | 1 143 700 | 1 210 500 | 1 278 100 |
| Common staff costs | 262 143 | 278 200 | 39 300 | (3 000) | 36 300 | 314 500 | 336 100 | 354 200 |
| Travel | 73 451 | 75 400 | 10 200 | (2 200) | 8 000 | 83 400 | 93 000 | 102 000 |
| Meetings | | | | | | | | |
| Technical committees, advisory groups | 28 911 | 53 000 | 6 000 | (20 000) | (14 000) | 39 000 | 43 000 | 48 000 |
| Representation and hospitality | 23 704 | 23 500 | 100 | – | 100 | 23 600 | 24 000 | 24 000 |
| Common services, supplies and equipment | – | 9 300 | 500 | 1 000 | 1 500 | 10 800 | 11 400 | 11 700 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 35 094 | 38 000 | 2 000 | 6 000 | 8 000 | 46 000 | 46 000 | 48 000 |
| Printing and publishing services | 5 555 | 14 000 | 1 400 | 600 | 2 000 | 16 000 | 19 000 | 20 000 |
| Data processing services | 425 | – | – | – | – | – | – | – |
| TOTAL | 1 388 360 | 1 568 000 | 146 000 | (37 000) | 109 000 | 1 677 000 | 1 783 000 | 1 886 000 |

## SUMMARY OF MANPOWER

Table O.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| DG | 1 | 1 | 1 | – | 1 | 1 | 1 |
| DDG | 3 | 3 | 3 | – | 3 | 3 | 3 |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 2 | 2 | 1 | – | 1 | 1 | 1 |
| P-4 | 1 | 1 | 2 | – | 2 | 2 | 2 |
| P-3 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-2 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| P-1 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| Sub-total | 13 | 13 | 13 | – | 13 | 13 | 13 |
| GS | 10 | 11 | 11 | – | 11 | 11 | 11 |
| TOTAL | 23 | 24 | 24 | – | 24 | 24 | 24 |

## CHANGES IN COSTS AND MANPOWER

### Costs

O/1. As will be seen from Table O.1 above, the cost of this programme is expected to increase by $109 000 as a net result of salary and other price increases of $146 000 and a programme decrease of $37 000.

O/2. The programme decrease of $12 000 in respect of salaries for established posts and common staff costs is attributable to the exchange of a P-5 post in the Office of the Deputy Director General for Research and Isotopes against a P-4 post from another programme. Further programme decreases are foreseen in respect of consultants' services ($2 700), overtime ($1 200), temporary assistance ($6 500) and travel ($2 200). The programme decrease of $20 000 in respect of technical committees and advisory groups relates to meetings of the Scientific Advisory Committee. The programme increase of $1 000 in respect of common services relates to the allocation of long-distance call costs.

O/3. With regard to the allocation of service costs, programme increases are foreseen in respect of linguistic services ($6 000) and printing and publishing services ($600).

### Manpower

O/4. As will be seen from Table O.2 above, one P-5 post is replaced by a P-4 post through a transfer from another programme in the adjusted manning table for 1980. Explanations are provided in Annex IV.

O/5. No further changes in manpower are foreseen for 1981, 1982 and 1983.

## THE PROGRAMME

### OBJECTIVE

O/6. The objective of the Office of the Director General is to propose and implement programmes within the scope of the Agency's statutory objectives, pursuant to decisions of the Board and the General Conference and on the advice of the Scientific Advisory Committee; it is also responsible for the efficient conduct and coordination of the Agency's work.

O/7. The objective of the Offices of the Deputy Directors General for Research and Isotopes, for Technical Assistance and Publications and for Technical Operations is to advise and assist the Director General in matters concerning the planning and implementation of the Agency's scientific programmes; they are also responsible for the effective execution of approved programmes within their respective Departments.

# P. ADMINISTRATION

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table P.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 4 382 569 | 5 139 000 | 362 000 | – | 362 000 | 5 501 000 | 5 980 000 | 6 431 000 |
| Consultants | 56 685 | 77 600 | 6 900 | (37 700) | (30 800) | 46 800 | 482 000 | 768 000 |
| Overtime | 12 620 | 15 600 | 1 000 | (200) | 800 | 16 400 | 24 500 | 27 700 |
| Temporary assistance | 139 390 | 78 300 | 5 300 | 3 700 | 9 000 | 87 300 | 107 000 | 90 400 |
| Sub-total | 4 591 264 | 5 310 500 | 375 200 | (34 200) | 341 000 | 5 651 500 | 6 593 500 | 7 317 100 |
| Common staff costs | 1 336 690 | 1 490 100 | 187 300 | – | 187 300 | 1 677 400 | 1 853 800 | 1 993 200 |
| Travel | 39 027 | 50 100 | 7 400 | (900) | 6 500 | 56 600 | 136 000 | 166 000 |
| Meetings | | | | | | | | |
| Conferences, symposia, seminars | 5 860 | – | – | – | – | – | 90 000 | 57 000 |
| Technical committees, advisory groups | 91 879 | 18 000 | 3 000 | 39 000 | 42 000 | 60 000 | 49 000 | 10 000 |
| Representation and hospitality | 13 783 | 18 200 | 700 | – | 700 | 18 900 | 29 000 | 33 400 |
| Scientific and technical contracts | 7 000 | – | – | – | – | – | – | – |
| Scientific supplies and equipment | – | – | – | – | – | – | – | 40 000 |
| Common services, supplies and equipment | 131 403 | 155 700 | 14 500 | 5 200 | 19 700 | 175 400 | 229 400 | 277 800 |
| Other items of expenditure | 89 469 | 9 400 | 400 | (4 600) | (4 200) | 5 200 | 7 300 | 8 500 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 426 398 | 440 000 | 24 000 | (3 000) | 21 000 | 461 000 | 542 000 | 584 000 |
| Printing and publishing services | 462 696 | 568 000 | 71 000 | (11 000) | 60 000 | 628 000 | 675 000 | 715 000 |
| Data processing services | 448 927 | 420 000 | (13 000) | (32 000) | (45 000) | 375 000 | 613 000 | 657 000 |
| To other: Safeguards | (138 000) | (160 000) | (12 000) | – | (12 000) | (172 000) | (180 000) | (190 000) |
| PNE | (38 000) | (48 000) | (4 000) | – | (4 000) | (52 000) | (54 000) | (56 000) |
| Conference services | – | (417 000) | (30 900) | (4 100) | (35 000) | (452 000) | (481 000) | (512 000) |
| TOTAL | 7 468 396 | 7 855 000 | 623 600 | (45 600) | 578 000 | 8 433 000 | 10 103 000 | 11 101 000 |

## SUMMARY OF MANPOWER

Table P.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| DDG | 1 | 1 | 1 | – | 1 | 1 | 1 |
| D | 6 | 6 | 6 | – | 6 | 6 | 6 |
| P-5 | 15 | 15 | 15 | – | 15 | 15 | 15 |
| P-4 | 16 | 16 | 17 | – | 17 | 18 | 18 |
| P-3 | 14 | 15 | 14 | 2 | 16 | 16 | 16 |
| P-2 | 12 | 12 | 12 | (2) | 10 | 10 | 10 |
| P-1 | 2 | 2 | 2 | – | 2 | 2 | 2 |
| Sub-total | 66 | 67 | 67 | – | 67 | 68 | 68 |
| GS | 105 | 114 | 115 | – | 115 | 121 | 124 |
| M&O | – | – | 3 | – | 3 | 3 | 3 |
| TOTAL | 171 | 181 | 185 | – | 185 | 192 | 195 |

## CHANGES IN COSTS AND MANPOWER

### Costs

P/1. As will be seen from Table P.1 above, it is expected that the cost of this programme will increase by $578 000 as a net result of salary and other price increases of $623 600 and a programme decrease of $45 600.

P/2. Programme decreases are foreseen in respect of consultants' services ($37 700, mainly in the Division of Budget and Finance), overtime ($200) and travel ($900). The programme increase of $3 700 in respect of temporary assistance is the net result of increased and reduced requirements in several Divisions. The programme increase of $39 000 in respect of technical committees and advisory groups reflects an increase in the number of meetings organized by the Legal Division. The net programme increase of $5 200 in respect of common services, supplies and equipment is almost offset by a programme decrease of $4 600 in respect of staff training in the Joint Medical Service (see under "Other items of expenditure").

P/3. With regard to the allocation of service costs, programme decreases are foreseen in respect of linguistic services ($3 000), printing and publishing services ($11 000) and data processing services ($32 000). The amount of $4 100 in respect of conference services represents an increase in the costs allocated to other programmes.

### Manpower

P/4. As will be seen from Table P.2 above, several changes are made in the adjusted manning table for 1980 in order to accommodate within the approved manning table the results of action taken following a survey of manpower requirements. The number of P-4 posts is increased by one and the number of P-3 posts decreased by one. In addition, one GS post and three M&O posts are transferred to this programme. For 1981, the upgrading of two P-2 posts to the P-3 level is required. Detailed justifications are provided in Annex IV.

P/5. For 1982, the addition of one P-4 post and three GS posts for the Division of Budget and Finance, of one GS post for the Division of External Relations and of two GS posts for the Division of Personnel (one for "Personnel services" and one for "Medical services") is foreseen. For 1983, the addition of three GS posts for the Division of Budget and Finance is foreseen.

## Summary of total costs by organization unit

Table P.3

| Organization unit | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Office of the Deputy Director General for Administration | 335 715 | 313 000 | 17 000 | 6 000 | 23 000 | 336 000 | 360 000 | 382 000 |
| Office of Internal Audit and Management Service | 345 178 | 431 000 | 33 800 | (800) | 33 000 | 464 000 | 517 000 | 552 000 |
| Division of Budget and Finance | 2 269 019 | 2 839 000 | 180 900 | (65 900) | 115 000 | 2 954 000 | 3 433 000 | 3 720 000 |
| Division of External Relations | 1 404 107 | 1 109 000 | 107 600 | (54 600) | 53 000 | 1 162 000 | 1 280 000 | 1 366 000 |
| Division of Public Information | 765 902 | 1 073 000 | 121 700 | 13 300 | 135 000 | 1 208 000 | 1 343 000 | 1 422 000 |
| Legal Division | 661 356 | 481 000 | 15 800 | 61 200 | 77 000 | 558 000 | 1 206 000 | 1 554 000 |
| Division of Personnel | | | | | | | | |
| Personnel services | 1 212 740 | 1 279 000 | 110 700 | (6 700) | 104 000 | 1 383 000 | 1 543 000 | 1 647 000 |
| Medical services | 474 379 | 330 000 | 36 100 | 1 900 | 38 000 | 368 000 | 421 000 | 458 000 |
| TOTAL | 7 468 396 | 7 855 000 | 623 600 | (45 600) | 578 000 | 8 433 000 | 10 103 000 | 11 101 000 |

## Summary of manpower by organization unit and category

Table P.4

| Organization unit | 1979 Adjusted budget | | | | 1980 Adjusted budget | | | | 1981 Estimate | | | | 1982 Preliminary estimate | | | | 1983 Preliminary estimate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P | GS | M&O | Total | P | GS | M&O | Total | P | GS | M&O | Total | P | GS | M&O | Total | P | GS | M&O | Total |
| Office of the Deputy Director General for Administration | 3 | 2 | – | 5 | 3 | 3 | – | 6 | 3 | 3 | – | 6 | 3 | 3 | – | 6 | 3 | 3 | – | 6 |
| Office of Internal Audit and Management Services | 5 | 4 | – | 9 | 5 | 4 | – | 9 | 5 | 4 | – | 9 | 5 | 4 | – | 9 | 5 | 4 | – | 9 |
| Division of Budget and Finance | 24 | 39 | – | 63 | 24 | 43 | – | 67 | 24 | 43 | – | 67 | 25 | 46 | – | 71 | 25 | 49 | – | 74 |
| Division of External Relations | 13 | 19 | – | 32 | 13 | 20 | – | 33 | 13 | 20 | – | 33 | 13 | 21 | – | 34 | 13 | 21 | – | 34 |
| Division of Public Information | 4 | 7 | – | 11 | 4 | 7 | – | 11 | 4 | 7 | – | 11 | 4 | 7 | – | 11 | 4 | 7 | – | 11 |
| Legal Division | 7 | 4 | – | 11 | 7 | 4 | – | 11 | 7 | 4 | – | 11 | 7 | 4 | – | 11 | 7 | 4 | – | 11 |
| Division of Personnel | | | | | | | | | | | | | | | | | | | | |
| Personnel services | 8 | 20 | – | 28 | 8 | 22 | – | 30 | 8 | 22 | – | 30 | 8 | 23 | – | 31 | 8 | 23 | – | 31 |
| Medical services | 2 | 10 | – | 12 | 3 | 12 | 3 | 18 | 3 | 12 | 3 | 18 | 3 | 13 | 3 | 19 | 3 | 13 | 3 | 19 |
| TOTAL | 66 | 105 | – | 171 | 67 | 115 | 3 | 185 | 67 | 115 | 3 | 185 | 68 | 121 | 3 | 192 | 68 | 124 | 3 | 195 |

## THE PROGRAMME

### OBJECTIVE

P/6. The objective is to ensure the effective functioning of the Agency's administrative activities. The Office of the Deputy Director General for Administration is responsible for the overall direction and supervision of the internal audit and management, budget and finance, personnel, legal and external relations services, in addition to the linguistic services and to the "General Services" programme. Certain matters related to internal administration in respect of the Secretariat of the Policy-making Organs will be co-ordinated with the Department of Administration.

### STRUCTURE

P/7. This programme consists of six sub-programmes, which are dealt with separately below.

*(see Table P.3)*

## SUB-PROGRAMME P.1

### Office of internal audit and management services

### OBJECTIVE

P.1/1. The objective is to carry out an independent appraisal activity in order to assist the Director General in achieving effectiveness of procedures and operations with a view to ensuring the economical and efficient use of the Agency's resources by:

(a) Reviewing financial and administrative procedures and operations covering all funds and resources administered by the Agency;
(b) Providing a management advisory service to all Departments; and
(c) Compiling and keeping up to date the Agency's Administrative Manual and other administrative instructions.

## SUB-PROGRAMME P.2

### Budget and finance services

### OBJECTIVE

P.2/1. The objective is to develop and implement programme, budgetary and financial procedures to ensure effective financial control and the attainment of programme objectives with the most economical use of available financial resources.

### PLANS FOR 1981–86

P.2/2. The Division of Budget and Finance will:

(a) Maintain the financial records, prepare the Agency's accounts and provide the data required for the effective financial management of the Agency;
(b) Be responsible for programme budgeting, to ensure effective use of resources and to facilitate planning and control of activities;
(c) Carry out the necessary work relating to Member States' contributions to the Regular Budget and other funds;
(d) Be responsible for establishing financial and budgetary systems, for documenting them and for issuing related regulations and instructions to the Agency's organizational units and staff members, as appropriate;

(e) Provide for or co-ordinate the Agency's representation at meetings of the United Nations or other international bodies on financial and budgetary matters; and
(f) Be responsible for establishing contracting policy, administering research-oriented contracts and maintaining centralized records of Agency contracts and agreements.

P.2/3. The Division of Budget and Finance plans to carry out in this period the following actions in order to strengthen its present system of financial management:
(a) Make a comprehensive and detailed study of the present accounting and budget system to provide a basis for further improvement, as necessary, of the integrity of the overall computerized system;
(b) Review the present systems of financial control over activities outside Vienna and over extra-budgetary resources and, based on these reviews, develop and implement improved systems;
(c) Design and implement improved cost measurement systems for VIC common services; and
(d) Design and implement an improved payroll system.

CO-OPERATION WITH OTHER ORGANIZATIONS

P.2/4. The Division of Budget and Finance is responsible for financial execution of UNDP and UNEP projects and for reporting thereon as required. The Division co-ordinates with UNESCO with respect to the joint operation of the Trieste Centre, with FAO with respect to the financial operations of the Joint FAO/IAEA Division and the operation of AGRIS and with UNIDO in respect of common services.

## SUB-PROGRAMME P.3

### External relations

OBJECTIVE

P.3/1. The objective is:
(a) To assist the Director General in the Agency's relations with Member States and with other international organizations;
(b) To direct the negotiation of safeguards agreements, to promote the negotiation, signature and entry into force of safeguards agreements and to participate in the studies relevant to non-proliferation; and
(c) To provide organizational and administrative services for scientific meetings at Headquarters and other locations and to co-ordinate and provide administrative services for all other Agency meetings (the General Conference, the Board of Governors and its committees, etc.)

PLANS FOR 1981–86

P.3/2. Advice will be given to the Director General and the Departments in the Secretariat on relations with Governments and with other organizations.

P.3/3. In co-operation with the Legal Division, the Division of External Relations will negotiate agreements in connection with safeguards and NPT and will continue the study on international plutonium management and other non-proliferation studies.

P.3/4. It will compile reports for the General Conference and prepare documents for the General Conference and the Board on matters affecting the external relations of the Agency. It will also oversee and maintain the Agency's relations with the United Nations and other international bodies. It will provide visa services to the Secretariat and protocol services to the Secretariat and to Missions and Delegations.

P.3/5. Through its offices at United Nations Headquarters in New York and in Geneva, permanent liaison will be maintained with the United Nations and with UNEP.

P.3/6. The servicing of the Agency's meetings both in Vienna and at locations in Member States will continue. The total number of scientific meetings now being serviced annually is around 150.

P.3/7. The Agency will continue sponsorship of non-Agency meetings which are of interest to the Agency's programme by providing scientific and, in some cases, organizational support. In all of these cases the Agency distributes the information concerning the meetings to all its Member States.

## SUB-PROGRAMME P.4

### Public information

OBJECTIVE

P.4/1. The objective is to keep Member States and the public informed of the Agency's activities through newspapers, conferences, periodicals, radio, television and exhibitions.

PLANS FOR 1981–86

P.4/2. The Division of Public Information will provide general information to Member States and the public and also to interested groups on the programmes and activities of the Agency. Special efforts will be made to inform the public on a wide basis about safety and environmental aspects of nuclear energy, with special emphasis on waste management questions. The Division will continue to publish, in various languages, brochures and leaflets concerning topical problems, their solution, past experience and future fields of research. It will also continue to publish the Bulletin, which reviews the Agency's programmes and various aspects of the peaceful uses of nuclear energy.

P.4/3. In the light of the growing interest of the public in nuclear power, the Division will intensify its efforts in providing objective, factual information about nuclear power and energy matters in general. To this end, it is planned to use more intensively the results of Agency scientific meetings, which will be presented in laymen's language. It is also planned to publicize more widely information on the environmental aspects of all energy sources and assessments of nuclear power, including those prepared by other organizations.

P.4/4. Non-proliferation and related questions will be publicized.

P.4/5. Because of the importance of the public acceptance issue, the Agency will become more active in providing objective, factual information about nuclear power, including information on safety-related accidents. In this way, and in response to similar work undertaken by WHO, UNEP, ICRP and UNSCEAR, it will help to supply the background against which a balanced opinion about the pros and cons of nuclear energy can be formed. Closer co-operation with national and international institutions dealing with energy and nuclear matters will be developed.

P.4/6. As in former years, public information activities will remain closely related to the activities of the Division of External Relations.

## SUB-PROGRAMME P.5

### Legal services

OBJECTIVE

P.5/1. The objective is:

(a) To give the Director General legal advice and to provide legal services to the Secretariat relating to all matters concerning the operations of the Agency;

(b) To collect, study and computerize information on nuclear law with a view to assisting Member States;
(c) To carry out training of officials of Member States and to provide advisory services to Member States in nuclear law and regulatory matters;
(d) To draft, negotiate and conclude agreements with States and other international organizations and to advise on the interpretation and application thereof, in particular with regard to safeguards agreements and the Headquarters Agreement;
(e) To defend the Agency's interests in contentious cases; and
(f) To promote developments in international law which are of interest to the Agency, in particular in the field of nuclear law.

STRUCTURE

P.5/2. This sub-programme includes two special projects, "International plutonium storage" and "International spent fuel management". They are described separately below.

PLANS FOR 1981–86

P.5/3. Legal assistance will be provided in the negotiation, conclusion and application of safeguards agreements with Member States and with other States which are party to NPT; such agreements will include safeguards agreements for purposes of the Tlatelolco Treaty.

P.5/4. Legal aspects of the physical protection of nuclear material and nuclear facilities, of nuclear safety and of radiological and environmental protection codes, guides and recommendations will continue to receive attention. This will include depositary functions for the Convention on the Physical Protection of Nuclear Material, opened for signature on 3 March 1980, and the organization of training courses on physical protection; participation in the revision of the Agency's Basic Safety Standards for Radiation Protection, scheduled for completion in 1981; and participation in the revision of the Agency's Regulations for the Safe Transport of Radioactive Materials during 1980–82.

P.5/5. Advice and assistance will be given in connection with the legal and institutional aspects of studies that might follow INFCE and the second NPT Review Conference.

P.5/6. Towards the end of 1982 a review of the Vienna Convention on Civil Liability for Nuclear Damage will become due if one third of the contracting parties express a desire that it take place. The Standing Committee on Civil Liability for Nuclear Damage will be convened in 1982 to consider the need for, and the extent of a review. Depending on its recommendations, a review conference may be scheduled for 1983.

P.5/7. Legal assistance will be provided to the "Nuclear Safety and Environmental Protection" programme in a review, during 1982–83, of the Agency's Revised Definition and Recommendations for the purposes of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter and in the discharge of responsibilities entrusted to the Agency under regional conventions such as the Convention for the Protection of the Mediterranean Sea against Pollution.

P.5/8. The negotiation and implementation of international conventions that may have an impact on the Agency will be followed closely; such conventions include those on the law of the sea and protection of the marine environment, hazardous substances other than oil, the carriage of goods by sea, international multimodal transport and the law of treaties between States and international organizations or between two or more international organizations.

P.5/9. Assistance will be given in framing and implementing legal arrangements for projects under the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology. Supply and project agreements for Agency assistance to Member States in securing the transfer of special fissionable material for reactor projects will be negotiated under the Legal Division's responsibility; this work is expected to increase as a consequence of the United States' offer to provide $1 million annually for five years for additional technical assistance in procuring low-enriched uranium for research reactor fuel and fuel cycle services.

P.5/10. Training of officials of Member States in nuclear law and regulatory matters will be provided by means of in-service training and interregional seminars. The provision of advisory services to developing countries in the elaboration and implementation of nuclear legislation will continue.

P.5/11. The Legal Division will administer the formalities of the Agency's contractual and treaty relationships, advise on and assist in the development of the Agency's internal law and procedures, and assist with all legal aspects of administration, including litigation.

### (a) International plutonium storage

Objective

P.5/12. The objective is to service a group of experts from some twenty-five Member States preparing proposals for an international plutonium storage scheme in implementation of Article XII.A.5 of the Agency's Statute and to implement such a scheme within the framework of the Agency if proposals are agreed on by the expert group and subsequently approved by the Board of Governors.

Results to date

P.5/13. The expert group on international plutonium storage first met in December 1978 and continued to meet in 1979. It has reached the stage of drafting the legal instruments necessary for establishing a scheme and is considering the detailed operational implications for the Agency.

Plans for 1981–82

P.5/14. The expert group will continue its work in 1981 with the objective of finalizing proposals for the establishment of a scheme for international plutonium storage to be considered by the Board in 1982. Should this scheme be approved by the Board, implementation will start immediately and the scheme should be fully operational within the period of this six-year programme.

### (b) International spent fuel management

Objective

P.5/15. The objective is to study the potential for international co-operation in the management of spent fuel and to determine the appropriate role which the Agency might play in solving problems created by growing accumulations of spent fuel.

Results to date

P.5/16. Two meetings of an expert group were held during 1979. It has been agreed that the study should be directed towards the provision of a necessary fuel cycle service in the best way possible rather than towards the establishment of an international spent fuel regime within the non-proliferation framework. Two sub-groups have been established to examine:

(a) technical-economic considerations; and
(b) institutional, legal and procedural considerations.

Plans for 1981–82

P.5/17. The expert group will probably meet twice during 1981 and the sub-groups will meet as needed to accomplish their tasks. The technical-economic sub-group should complete its work by mid-1981 and the institutional, legal and procedural sub-group by the end of 1981. Implementation of recommendations from the expert group could begin in 1982, with assistance being provided to Member States which might be interested in initiating a regional or multinational storage arrangement.

Related activities

P.5/18. Related activities include work on the back-end of the nuclear fuel cycle in the Division of Nuclear Power and Reactors and on spent fuel transport in the Division of Nuclear Safety and Environmental Protection.

Outline of changes during 1983–86

P.5/19. Activities during this period will depend on the final report and recommendations of the expert group towards the end of 1981.

Co-operation with other organizations

P.5/20. NEA and CEC are participating in the work of the expert group and their continued co-operation is expected.

## SUB-PROGRAMME P.6

### Personnel services (including the Joint Medical Service)

OBJECTIVE

P.6/1. The objective is:

(a) To prepare documentation on personnel matters for the Board of Governors and the General Conference and to advise the Director General on all personnel matters;
(b) To administer a personnel system which is in line with the Statute and Staff Regulations and with other directives of the Board of Governors and which contributes to meeting the objectives and fulfilling the functions of the Agency;
(c) To recruit and maintain the staff of the Secretariat in a manner that will ensure the optimum use of available human resources, due regard being given to the principle of widest possible geographical distribution;
(d) To maintain effective staff/management relations and ensure that consultation as provided for in the Staff Regulations and Rules is undertaken; and
(e) To participate in the activities of inter-agency (e.g. CCAQ) and inter-governmental (e.g. ICSC) bodies established for the purpose of co-ordinating personnel policy within the United Nations system with a view to establishing a unified international civil service.

PLANS FOR 1981–86

P.6/2. In addition to administering the Agency's personnel sub-programme, including the Joint Medical Service, the Division of Personnel plans to carry out in this period the following actions in order to strengthen and improve the existing system of personnel management:

(a) To review conditions of employment and develop improved methods of personnel management which ensure optimum utilization of human resources and better motivation of staff members, taking into account recommendations of ICSC;
(b) To explore new recruitment sources and develop recruitment standards in order to improve the proportion of women and persons from under-represented areas on the Agency's staff;
(c) To introduce a training and staff development system designed to increase the effectiveness and satisfaction of staff members in their jobs and hence the efficiency of the Agency; and
(d) To harmonize, to the extent possible, the conditions of employment of the Agency with those of the other organizations located in Vienna.

## MEETINGS IN 1981–82

Within the limits of the appropriations and subject to the requirements as outlined for 1981–82, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

| 1981 | | Paragraph |
|---|---|---|
| 1. | Expert Group on International Plutonium Storage<br>(a) Three plenary meetings<br>(b) Three technical group meetings | P.5/14 |
| 2. | Expert Group on International Spent Fuel Management<br>(a) Two plenary meetings | P.5/17 |

| 1982 | | |
|---|---|---|
| 1. | Standing Committee on Civil Liability for Nuclear Damage | P.5/6 |
| 2. | Expert Group on International Plutonium Storage | P.5/14 |
| 3. | Expert Group on International Spent Fuel Management | P.5/17 |

# Q. GENERAL SERVICES

## COSTS OF THE PROGRAMME

### Summary by items of expenditure: Table Q.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 833 752 | 2 331 000 | 199 000 | (155 000) | 44 000 | 2 375 000 | 2 532 000 | 2 711 000 |
| Consultants | 38 013 | 22 100 | – | (22 100) | (22 100) | – | – | – |
| Overtime | 55 536 | 17 500 | 1 000 | – | 1 000 | 18 500 | 30 000 | 33 000 |
| Temporary assistance | 212 508 | 35 100 | 2 300 | (5 700) | (3 400) | 31 700 | 50 000 | 53 000 |
| Sub-total | 3 139 809 | 2 405 700 | 202 300 | (182 800) | 19 500 | 2 425 200 | 2 612 000 | 2 797 000 |
| Common staff costs | 864 120 | 675 500 | 95 700 | (47 000) | 48 700 | 724 200 | 784 700 | 840 700 |
| Travel | 715 | 1 000 | 100 | – | 100 | 1 100 | 3 000 | 4 000 |
| Representation and hospitality | 233 | 200 | – | – | – | 200 | 300 | 300 |
| Common services, supplies and equipment | 4 745 095[a] | 8 875 600 | 989 400 | 33 300 | 1 022 700 | 9 898 300 | 10 795 000 | 11 744 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 3 808 | 9 000 | 500 | 500 | 1 000 | 10 000 | 11 000 | 11 000 |
| Printing and publishing services | 266 906 | 228 000 | 27 000 | 11 000 | 38 000 | 266 000 | 267 000 | 300 000 |
| Data processing services | 24 777 | 21 000 | (1 000) | 8 000 | 7 000 | 28 000 | 35 000 | 48 000 |
| TOTAL | 9 045 463 | 12 216 000 | 1 314 000 | (177 000) | 1 137 000 | 13 353 000 | 14 508 000 | 15 745 000 |

[a] Includes $1 386 085 in respect of cost of transfer to permanent headquarters. See Document GC(XXIV)/629, Statement I.A., The Agency's Accounts for 1979.

## SUMMARY OF MANPOWER

Table Q.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 2 | 2 | 2 | – | 2 | 2 | 2 |
| P-4 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| P-3 | 2 | 2 | 1 | – | 1 | 1 | 1 |
| P-2 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| Sub-total | 9 | 9 | 8 | – | 8 | 8 | 8 |
| GS | 70 | 70 | 69 | – | 69 | 69 | 69 |
| M&O | 127 | 39 | 30 | – | 30 | 30 | 30 |
| TOTAL | 206 | 118 | 107 | – | 107 | 107 | 107 |

## CHANGES IN COSTS AND MANPOWER

### Costs

Q/1. As will be seen from Table Q.1 above, it is expected that the cost of this programme will increase by $1 137 000 as a net result of price increases of $1 314 000 and a programme decrease of $177 000.

Q/2. The programme decrease of $202 000 in respect of salaries for established posts and common staff costs reflects the changes in the adjusted manning table for 1980. No provision is made for consultants' services in 1981, which results in a programme decrease of $22 100. A programme decrease of $5 700 is foreseen in respect of temporary assistance.

Q/3. The requirements for common services, supplies and equipment are expected to remain unchanged, with the exception of the Agency's contribution of $33 300 to the Sinking Fund, which represents a programme increase.

Q/4. With regard to the allocation of service costs, programme increases are expected in respect of linguistic services ($500), printing and publishing services ($11 000) and data processing services ($8 000).

### Manpower

Q/5. As will be seen from Table Q.2 above, several changes are made in the adjusted manning table for 1980: one P-3 post, one GS post and nine M&O posts are transferred to other programmes. Detailed explanations are given in Annex IV.

Q/6. No further changes in manpower are expected for 1981, 1982 and 1983.

Costs of common services, supplies and equipment

Table Q.3

| | 1979 Actual obligations | 1980 Adjusted budget | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|
| Division of General Services | | | | | |
| Services: | | | | | |
| Communications | 608 243 | 761 000 | 852 000 | 868 000 | 890 000 |
| Freight and transportation | 55 345 | 47 000 | 63 000 | 68 000 | 74 000 |
| Rental of premises | 116 137 | 29 000 | 29 000 | 32 000 | 36 000 |
| Servicing of office equipment | 51 349 | 87 000 | 92 000 | 103 000 | 112 000 |
| Utilities | 1 021 220 | 2 245 000 | 2 790 000 | 3 118 000 | 3 472 000 |
| Maintenance services (contractual) | 613 466 | 3 624 000 | 3 563 000 | 3 872 000 | 4 132 000 |
| Maintenance services (in house) | 185 000 | 777 000 | 890 000 | 950 000 | 1 062 000 |
| Security services (in house) | 179 000 | 718 000 | 860 000 | 930 000 | 1 005 000 |
| Sinking Fund, major repairs and replacement | – | – | 33 300 | 33 300 | 33 300 |
| Other | 35 494 | 5 000 | – | 4 700 | 7 700 |
| Sub-total | 2 865 254 | 8 293 000 | 9 172 300 | 9 979 000 | 10 824 000 |
| Supplies: | | | | | |
| Building and maintenance supplies | 144 183 | 232 000 | 270 000 | 292 000 | 314 000 |
| Office supplies | 125 261 | 161 000 | 179 000 | 210 000 | 226 000 |
| Expendable equipment | 151 982 | 98 000 | 137 000 | 108 000 | 163 000 |
| Other | 5 190 | 5 000 | 5 000 | 7 000 | 8 000 |
| Sub-total | 426 616 | 496 000 | 591 000 | 617 000 | 711 000 |
| Equipment: | | | | | |
| Building, property and maintenance equipment | 493 | – | – | – | – |
| Office furniture and equipment | 49 913 | 86 600 | 97 000 | 189 000 | 198 000 |
| Transportation equipment | 16 734 | – | 38 000 | 10 000 | 11 000 |
| Other | – | – | – | – | – |
| Sub-total | 67 140 | 86 600 | 135 000 | 199 000 | 209 000 |
| TOTAL | 3 359 010[1] | 8 875 600 | 9 898 300 | 10 795 000 | 11 744 000 |

[1] Excludes transfer of the Agency to its Permanent Headquarters.

## THE PROGRAMME

### OBJECTIVE

Q/7. The objective is to provide support services to the Agency (in particular the following: purchase and supply services, including such services for the Agency's Laboratories in Seibersdorf, the Monaco Laboratory and the Trieste Centre; telecommunications and transport services; archive services; registry, mailing and mail distribution services; and electronics services for Agency meetings), to carry out inventory checks on Agency property, and to operate the Commissary and provide a housing service for the international organizations at VIC and the Permanent Missions in Vienna.

### PLANS FOR 1981–86

Q/8. The Division will continue its efforts – in close co-operation with other users of the VIC complex – to improve the control of operating costs and energy consumption with the aim of reducing expenses.

Q/9. Standards will be established, in consultation with other users, for periodic maintenance and cost-benefit comparisons relating to the use of contractual and in-house services will be initiated.

# R. SERVICE ACTIVITIES

## THE PROGRAMME

R/1. This programme consists of the two-sub-programmes which are dealt with separately below. Since each sub-programme is solely concerned with the provision of services in support of the Agency's functional programmes, the total cost in each case is entirely apportioned between those programmes which require the services.

### Linguistic services

(Translation and records services and interpretation services)

### COSTS OF TRANSLATION AND RECORDS SERVICES

Summary by items of expenditure: Table R.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 094 062 | 2 464 000 | 116 000 | – | 116 000 | 2 580 000 | 2 776 000 | 2 941 000 |
| Overtime | 14 432 | 23 700 | 1 400 | 7 400 | 8 800 | 32 500 | 32 000 | 22 000 |
| Temporary assistance | 158 710 | 193 900 | 11 600 | 14 500 | 26 100 | 220 000 | 200 000 | 207 000 |
| Sub-total | 2 267 204 | 2 681 600 | 129 000 | 21 900 | 150 900 | 2 832 500 | 3 008 000 | 3 170 000 |
| Common staff costs | 639 215 | 714 800 | 71 800 | – | 71 800 | 786 600 | 860 000 | 912 000 |
| Travel | – | 1 600 | 300 | – | 300 | 1 900 | 2 000 | 2 000 |
| Scientific and technical contracts | 8 553 | 15 000 | 700 | 15 300 | 16 000 | 31 000 | 22 000 | 23 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | (2 916 315) | (3 420 000) | (202 000) | (39 000) | (241 000) | (3 661 000) | (3 901 000) | (4 116 000) |
| Printing and publishing services | 1 343 | 2 000 | 200 | 800 | 1 000 | 3 000 | 3 000 | 3 000 |
| Data processing services | – | 5 000 | – | 1 000 | 1 000 | 6 000 | 6 000 | 6 000 |
| TOTAL | – | – | – | – | – | – | – | – |

## SUMMARY OF MANPOWER (TRANSLATION AND RECORDS SERVICES)

Table R.2

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 4 | 4 | 4 | – | 4 | 4 | 4 |
| P-4 | 11 | 11 | 11 | – | 11 | 11 | 11 |
| P-3 | 22 | 22 | 23 | – | 23 | 23 | 23 |
| Sub-total | 38 | 38 | 39 | – | 39 | 39 | 39 |
| GS | 37 | 37 | 37 | – | 37 | 37 | 37 |
| M&O | 1 | 1 | 1 | – | 1 | 1 | 1 |
| TOTAL | 76 | 76 | 77 | – | 77 | 77 | 77 |

## LINGUISTIC SERVICES: BREAKDOWN OF COSTS BY PROGRAMME

Table R.3

| | 1979 Actual obligations | 1980 Adjusted budget | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|
| Technical assistance | 291 896 | 261 000 | 375 000 | 400 000 | 420 000 |
| Nuclear power | 155 905 | 109 000 | 95 000 | 115 000 | 128 000 |
| Nuclear fuel cycle | – | 96 000 | 73 000 | 86 000 | 85 000 |
| Nuclear safety | 532 792 | 409 000 | 462 000 | 474 000 | 501 000 |
| Nuclear explosions for peaceful purposes | 10 224 | 9 000 | 5 000 | 10 000 | 16 000 |
| Food and agriculture | 85 749 | 175 000 | 178 000 | 196 000 | 217 000 |
| Life sciences | 49 573 | 79 000 | 37 000 | 45 000 | 59 000 |
| Physical sciences | 137 704 | 102 000 | 103 000 | 115 000 | 120 000 |
| The Laboratory | 17 710 | 10 000 | 16 000 | 17 000 | 18 000 |
| International Laboratory of Marine Radioactivity | 136 | 1 000 | 1 000 | 1 000 | 1 000 |
| Safeguards | 180 364 | 192 000 | 233 000 | 253 000 | 273 000 |
| Information and technical services | 91 494 | 79 000 | 90 000 | 73 000 | 78 000 |
| Policy-making Organs | 891 892 | 1 402 000 | 1 471 000 | 1 511 000 | 1 551 000 |
| Executive management and technical programme planning | 35 094 | 38 000 | 46 000 | 46 000 | 48 000 |
| Administration | 426 398 | 440 000 | 461 000 | 542 000 | 584 000 |
| General services | 3 808 | 9 000 | 10 000 | 11 000 | 11 000 |
| Service activities | 5 576 | 9 000 | 5 000 | 6 000 | 6 000 |
| TOTAL | 2 916 315 | 3 420 000 | 3 661 000 | 3 901 000 | 4 116 000 |

SUMMARY OF MANPOWER (INTERPRETATION SERVICES)

Table R.4

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| P-5 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-4 | 5 | 5 | 4 | – | 4 | 4 | 4 |
| P-3 | 3 | 3 | 3 | – | 3 | 3 | 3 |
| Sub-total | 9 | 9 | 8 | – | 8 | 8 | 8 |
| GS | 1 | 1 | 1 | – | 1 | 1 | 1 |
| TOTAL | 10 | 10 | 9 | – | 9 | 9 | 9 |

## CHANGES IN COSTS AND MANPOWER

### Costs

R/2. As will be seen from Table R.1 above, the total cost of linguistic services (translation and records services provided by the Division of Languages) will be charged to the programmes for which these services are provided. Interpretation costs are not included in Table R.1 but are charged direct to the meetings requiring interpretation, as explained in the Introduction. The manning table of the Interpretation Section is, however, shown (Table R.4).

R/3. The costs of linguistic services are expected to increase by $241 000, of which $202 000 is required to cover salary and other price increases and $39 000 is a programme increase. The latter is related to requirements for overtime ($7 400), temporary assistance ($14 500), contractual translation services ($15 300, under "Scientific and technical contracts"), printing and publishing services ($800) and data processing services ($1 000).

### Manpower

R/4. As will be seen from Table R.2 above, one P-3 post has been added in the adjusted manning table for 1980. The manning table of the Interpretation Section (Table R.4) has been reduced by one Professional post. Explanations are given in Annex IV.

R/5. No further changes in manpower are foreseen for 1981, 1982 and 1983.

### Interpretation

R/6. Depending on the character and scope of any meeting held or sponsored by the Agency, simultaneous interpretation from and into four languages may have to be provided for it. The order English, French, Russian and Spanish reflects the frequency of use of these four languages; in addition, German is occasionally required. The interpretation services are also called upon from time to time to assist members of the staff in their day-to-day work by providing consecutive interpretation for meetings of small groups, informal conversations and the like.

### Translation and records

R/7. By far the greatest part of the translation work in the Secretariat is from and into English, French, Russian and Spanish (the four working languages), with some translation from and into German and less from other languages. The material translated consists of the many different types of document prepared throughout the Secretariat or received from outside for meetings held or sponsored by the Agency, the records and reports of those meetings, proceedings and other documents for publication, correspondence and working papers of all kinds required by the staff for their day-to-day work.

R/8. In so far as records are concerned, their provisional versions are drafted by the linguistic staff. This staff also provides advice on linguistic matters to the Secretariat as a whole and types a considerable proportion of the material to be printed by the Agency, the remainder being handled by the publishing services.

## Printing and publishing services

## COSTS OF THE SUB-PROGRAMME

### Summary by items of expenditure: Table R.5

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 2 573 466 | 2 738 000 | 232 000 | (94 000) | 138 000 | 2 876 000 | 3 113 000 | 3 386 000 |
| Overtime | 28 875 | 29 700 | 1 900 | (6 600) | (4 700) | 25 000 | 25 000 | 21 000 |
| Temporary assistance | 74 315 | 50 100 | 3 900 | 11 000 | 14 900 | 65 000 | 41 000 | 32 000 |
| Sub-total | 2 676 656 | 2 817 800 | 237 800 | (89 600) | 148 200 | 2 966 000 | 3 179 000 | 3 439 000 |
| Common staff costs | 785 554 | 793 900 | 110 700 | (26 000) | 84 700 | 878 600 | 965 800 | 1 049 800 |
| Travel | 440 | 3 200 | 500 | (500) | – | 3 200 | 4 000 | 5 000 |
| Representation and hospitality | – | 200 | – | – | – | 200 | 200 | 200 |
| Scientific and technical contracts | 2 326 | 5 000 | 300 | (300) | – | 5 000 | 5 000 | 6 000 |
| Common services, supplies and equipment | 1 168 964 | 1 546 900 | 249 200 | (217 100) | 32 100 | 1 579 000 | 1 470 000 | 1 609 000 |
| Transfer of costs: | | | | | | | | |
| Linguistic services | 5 576 | 9 000 | 500 | (4 500) | (4 000) | 5 000 | 6 000 | 6 000 |
| Printing and publishing services | (4 677 084) | (5 228 000) | (598 000) | 322 000 | (276 000) | (5 504 000) | (5 705 000) | (6 185 000) |
| Data processing services | 37 568 | 52 000 | (1 000) | 16 000 | 15 000 | 67 000 | 75 000 | 70 000 |
| TOTAL | – | – | – | – | – | – | – | – |

## SUMMARY OF MANPOWER

Table R.6

| Grade of post | Number of established posts | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| D | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-5 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-4 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| P-3 | 5 | 5 | 4 | – | 4 | 4 | 4 |
| P-2 | 6 | 6 | 6 | – | 6 | 6 | 6 |
| P-1 | 1 | 1 | 1 | – | 1 | 1 | 1 |
| Sub-total | 15 | 15 | 14 | – | 14 | 14 | 14 |
| GS | 109 | 111 | 111 | 1 | 112 | 119 | 122 |
| M&O | 15 | 15 | 19 | – | 19 | 19 | 21 |
| TOTAL | 139 | 141 | 144 | 1 | 145 | 152 | 157 |

## CHANGES IN COSTS AND MANPOWER

### Costs

R/9. As will be seen from Table R.5 above, the cost of printing and publishing services will be charged to the programmes for which services are provided. The total cost of the "Printing and publishing" sub-programme is expected to increase by $276 000 as a net result of salary and other price increases of $598 000 and a programme decrease of $322 000.

R/10. The programme decrease of $120 000 in respect of salaries for established posts and common staff costs is the net result of several changes in manpower. One P-3 editor post is transferred to another programme and four M&O posts are transferred to this programme in the adjusted manning table for 1980; and one GS post is added in 1981. In view of the expected work-load under "Work for others", part of the manpower cost is charged to "Work for others". Programme decreases are foreseen in respect of overtime ($6 600), travel ($500), contractual services ($300) and common services, supplies and equipment ($217 000). A programme increase of $11 000 is foreseen in respect of temporary assistance.

R/11. With regard to the allocation of service costs, a programme decrease is foreseen in respect of linguistic services ($4 500) and a programme increase in respect of data processing services ($16 000).

R/12. It is expected that income from the sale of publications will amount to $700 000 in 1981.

### Manpower

R/13. As will be seen from Table R.6 above, one P-3 post is transferred to another programme and four M&O posts are transferred to this programme in the adjusted manning table for 1980. Explanations of the transfers are provided in Annex IV.

R/14. For 1981, the addition of one GS post is foreseen. A justification is provided in Annex IV.

R/15. For 1982, the addition of seven GS posts is foreseen. For 1983, the addition of three GS posts and two M&O posts is foreseen.

## Summary of costs by programme component

Table R.7

| Programme component | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Printing services | 3 502 095 | 3 871 000 | 480 000 | (100 000) | 380 000 | 4 251 000 | 4 377 000 | 4 770 000 |
| Publishing services | 1 174 989 | 1 357 000 | 118 000 | (222 000) | (104 000) | 1 253 000 | 1 328 000 | 1 415 000 |
| Sub-total | 4 677 084 | 5 228 000 | 598 000 | (322 000) | 276 000 | 5 504 000 | 5 705 000 | 6 185 000 |
| Less | | | | | | | | |
| Transfer to other programmes | 4 677 084 | 5 228 000 | 598 000 | (322 000) | 276 000 | 5 504 000 | 5 705 000 | 6 185 000 |
| TOTAL | – | – | – | – | – | – | – | – |

## PRINTING AND PUBLISHING SERVICES: BREAKDOWN OF COSTS BY PROGRAMME

Table R.8

| | 1979 Actual obligations | 1980 Adjusted budget | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|
| Technical assistance | 94 687 | 126 000 | 144 000 | 160 000 | 180 000 |
| Nuclear power | 369 230 | 390 000 | 263 000 | 256 000 | 280 000 |
| Nuclear fuel cycle | – | 319 000 | 311 000 | 313 000 | 302 000 |
| Nuclear safety | 782 481 | 555 000 | 627 000 | 640 000 | 653 000 |
| Nuclear explosions for peaceful purposes | 353 | 2 000 | 2 000 | 15 000 | 18 000 |
| Food and agriculture | 257 594 | 394 000 | 420 000 | 449 000 | 519 000 |
| Life sciences | 178 442 | 280 000 | 263 000 | 226 000 | 240 000 |
| Physical sciences | 503 984 | 558 000 | 623 000 | 673 000 | 720 000 |
| The Laboratory | 15 318 | 20 000 | 31 000 | 29 000 | 31 000 |
| International Centre for Theoretical Physics | 27 763 | 160 000 | 190 000 | 190 000 | 190 000 |
| International Laboratory of Marine Radioactivity | 104 | 2 000 | 2 000 | 2 000 | 3 000 |
| Safeguards | 243 396 | 134 000 | 168 000 | 223 000 | 305 000 |
| Information and technical services | 904 282 | 974 000 | 1 035 000 | 1 066 000 | 1 176 000 |
| Policy-making Organs | 240 475 | 502 000 | 512 000 | 499 000 | 530 000 |
| Executive management and technical programme planning | 5 555 | 14 000 | 16 000 | 19 000 | 20 000 |
| Administration | 462 696 | 568 000 | 628 000 | 675 000 | 715 000 |
| General services | 266 906 | 228 000 | 266 000 | 267 000 | 300 000 |
| Service activities | 1 343 | 2 000 | 3 000 | 3 000 | 3 000 |
| Transfer of costs to other programmes | 4 354 609 | 5 228 000 | 5 504 000 | 5 705 000 | 6 185 000 |

### Printing services

#### Objective

R/16. The objective is to provide printing and distribution services for Agency documents and publications, to provide reproduction facilities to meet the requirements of the General Conference, the Board of Governors and the Secretariat (including the scientific publications programme and INIS) and to meet, on a reimbursable basis, the reproduction requirements of the United Nations organizations participating in the Common Printing Service (CPS) at VIC.

#### Plans for 1981–82

R/17. The volume of printing work will be determined by the activities of the Agency and of the United Nations organizations participating in the CPS. There is evidence that the combined volume of reproduction work will reach 200 million page-units, a good part of it constituting rapid service for meetings. This will have an impact on the staffing level in the Division of Publications and will entail investments for the replacement of old equipment and enlargement of the Division's capacity to the extent necessary for meeting its obligation to provide an effective common service.

R/18. The staff and investment costs, as determined through a new cost-accounting system, will be reimbursed by customers on the basis of work done for them.

#### Outline of changes during 1983–86

R/19. Efforts will be made to extend the use of computerized typesetting in producing the Agency's scientific publications and other bulky documents, in the light of experience gained in a joint Printing Section/Computer Section venture involving the processing of material for INIS and AGRIS.

## Publishing services

### Objective

R/20. The objective is to prepare, publish and distribute Agency publications emanating either from the Agency's own programmes or from programmes organized in collaboration with other international organizations. About half of the copies of each publication are provided free of charge to Member States; the remaining copies are put on sale, the revenues helping to cover publication cost.

### Plans for 1981–82

R/21. The Division of Publications will publish the proceedings of all scientific conferences and symposia listed in this document, the reports of certain technical committees and advisory groups, and also other books and journals reflecting the work of the Agency's scientific programmes. In addition, the Division will publish ATOMINDEX and other INIS material and CINDA.

R/22. A continuous effort will be made to maintain a high scientific and editorial standard for all Agency publications and, through broader promotional activities, to increase sales. A comprehensive publications catalogue, which is issued every second year, will be published in 1982.

# S. COST OF WORK FOR OTHERS

Table S.1

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Cost of work for others | 1 244 242 | 1 965 000 | 133 000 | 965 000 | 1 098 000 | 3 063 000 | 3 240 000 | 3 440 000 |
| TOTAL | 1 244 242 | 1 965 000 | 133 000 | 965 000 | 1 098 000 | 3 063 000 | 3 240 000 | 3 440 000 |

Summary of costs by sub-programme

Table S.2

| Sub-programme | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Library services | 93 612 | 618 000 | 61 000 | 71 000 | 132 000 | 750 000 | 796 000 | 851 000 |
| Data processing services | 646 808 | 719 000 | – | 60 000 | 60 000 | 779 000 | 825 000 | 876 000 |
| Medical services | 181 347 | 287 000 | 35 000 | – | 35 000 | 322 000 | 348 000 | 379 000 |
| Printing services | 322 475 | 341 000 | 37 000 | 834 000 | 871 000 | 1 212 000 | 1 271 000 | 1 334 000 |
| TOTAL | 1 244 242 | 1 965 000 | 133 000 | 965 000 | 1 098 000 | 3 063 000 | 3 240 000 | 3 440 000 |

## Summary of costs by items of expenditure

Table S.3

| Item of expenditure | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|
| | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | |
| Established posts | 636 000 | 54 000 | 356 000 | 410 000 | 1 046 000 | 1 134 000 | 1 210 000 |
| Overtime | 2 000 | 100 | 21 900 | 22 000 | 24 000 | 25 000 | 28 000 |
| Temporary assistance | 112 700 | 10 200 | 120 100 | 130 300 | 243 000 | 250 000 | 269 000 |
| Sub-total | 750 700 | 64 300 | 498 000 | 562 300 | 1 313 000 | 1 409 000 | 1 507 000 |
| Common staff costs | 183 000 | 27 000 | 109 000 | 136 000 | 319 000 | 351 000 | 375 000 |
| Travel | 6 000 | 1 000 | – | 1 000 | 7 000 | 8 000 | 9 000 |
| Common services, supplies and equipment | 1 025 300 | 40 700 | 358 000 | 398 700 | 1 424 000 | 1 472 000 | 1 549 000 |
| TOTAL | 1 965 000 | 133 000 | 965 000 | 1 098 000 | 3 063 000 | 3 240 000 | 3 440 000 |

# S. COST OF WORK FOR OTHERS

## CHANGES IN COSTS

S/1. As will be seen from Table S.1 above, the cost of work for others is expected to increase by $1 098 000, of which $133 000 will be required to cover salary and other price increases and $965 000 is a programme increase. As can be seen from Table S.2 below, the programme increase consists of: $71 000 in respect of the Library; $60 000 for data processing services; and $834 000 for printing services (the latter amount is exceptionally high because it includes the costs of materials, which were previously charged directly to UNIDO).

S/2. In accordance with the agreement on common services at the Vienna International Centre, the costs incurred by the Agency in respect of library, data processing, medical and printing services will be recovered from the organizations for which the services are provided. Income from work for others, in an offsetting amount of $3 063 000, is part of the Agency's miscellaneous income, as can be seen from Table 4.

ANNEXES I–VI

ANNEX I

CONFERENCES, SYMPOSIA AND SEMINARS IN 1981

Within the limits of the appropriations and subject to the requirements of the individual programmes as outlined for 1981, it is planned to hold the meetings listed below. All meetings were considered by the Scientific Advisory Committee. The reference following each meeting is to the relevant paragraph in the programme.

| | | |
|---|---|---|
| **Nuclear power** | | |
| 1. | Symposium on quality assurance for nuclear power plants | B.3.2/5 |
| **Nuclear fuel cycle** | | |
| 2. | Seminar on management of radioactive waste from nuclear power plants | C.2.1/14 |
| 3. | Symposium on migration in the terrestrial environment of long-lived radionuclides from the nuclear fuel cycle | C.2.2/11 and C.2.3/11 |
| **Nuclear safety** | | |
| 4. | Symposium on the application of the dose limitation system in nuclear fuel cycle facilities and other radiation practices | D.1.1/7 |
| 5. | Seminar on radiation emergency preparedness for developing countries | D.1.5/10 |
| 6. | Seminar on governmental organization for the regulation of nuclear power plants | D.2.4/4 |
| **Food and agriculture** | | |
| 7. | FAO/IAEA symposium on induced mutations as a tool for further crop plant improvement | F.2.3/7 |
| 8. | FAO/IAEA symposium on the sterile insect technique (SIT) and the use of radiation in genetic insect control | F.4/6 |
| 9. | FAO/IAEA regional seminar on food irradiation in Asia | F.6.1/10 |
| **Life sciences** | | |
| 10. | Seminar on quality assurance in the use of nuclear medicine instruments in Latin America | G.1.3/5 |
| 11. | Symposium on nuclear techniques in the study of parasitic diseases of man and animals (to be held jointly with FAO/IAEA Division) | G.3.2/5 |
| 12. | Seminar on prospective methods of radiation therapy in developing countries | G.3.3/6 |
| 13. | Symposium on comparative health impacts of nuclear and alternative sources of energy | G.3.5/8 |
| **Physical sciences** | | |
| 14. | Conference on industrial applications of radioisotopes and radiation technology | H.2.1/7 |
| 15. | Seminar on isotope techniques in water resources development | H.3/3 |
| 16. | Symposium on methods of low-level counting and spectrometry | H.3.4/9 |
| **Safeguards** | | |
| 17. | Safeguards workshop seminar | L.3/11 |
| **Information and technical services** | | |
| 18. | INIS/AGRIS training seminar | M.1/13 |

## ANNEX II

## CONFERENCES, SYMPOSIA AND SEMINARS IN 1982

A list of scientific meetings considered by the Scientific Advisory Committee is presented for the second year of the biennium 1981–82. The reference following each meeting is to the relevant paragraph in the programme.

Nuclear power

| | | |
|---|---|---|
| 1. | Symposium on nuclear power plant control and instrumentation | B.3.1/7 |
| 2. | Symposium on water chemistry and corrosion problems of nuclear power systems and components | B.3.1/7 |

Nuclear fuel cycle

| | | |
|---|---|---|
| 3. | Symposium on conditioning of radioactive waste for storage and disposal | C.2.1/10 |
| 4. | Seminar on testing and operation of off-gas cleaning systems at nuclear facilities | C.2.1/11 |
| 5. | Symposium on management of waste from uranium mining and milling | C.2.1/12 |

Nuclear safety

| | | |
|---|---|---|
| 6. | Seminar on emergency preparedness for developing countries | D.1.5/10 |
| 7. | Seminar on siting of nuclear power plants for developing countries | D.2.4/4 |

Food and agriculture

| | | |
|---|---|---|
| 8. | FAO/IAEA regional seminar on utilization of induced mutations for crop improvement in Latin America | F.2.3/7 |
| 9. | FAO/IAEA regional seminar on control and/or eradication of the Mediterranean fruit fly by use of the SIT as a basis for an integrated pest management programme in Latin America | F.4.1/3 |
| 10. | FAO/IAEA symposium on isotope techniques in comparative studies of food and environmental contamination | F.5.2/3 |

Life sciences

| | | |
|---|---|---|
| 11. | Symposium on radioimmunoassay and related procedures in medicine | G.1.1/8 and G.1.2/8 |
| 12. | Seminar on high-dose dosimetry in industrial radiation processing | G.2.4/6 |

Physical sciences

| | | |
|---|---|---|
| 13. | Conference on plasma physics and controlled nuclear fusion research | H.1.3/9 |
| 14. | Seminar on nuclear analytical technology and applications in mineral exploration, mining and processing | H.2.1/7 |

Safeguards

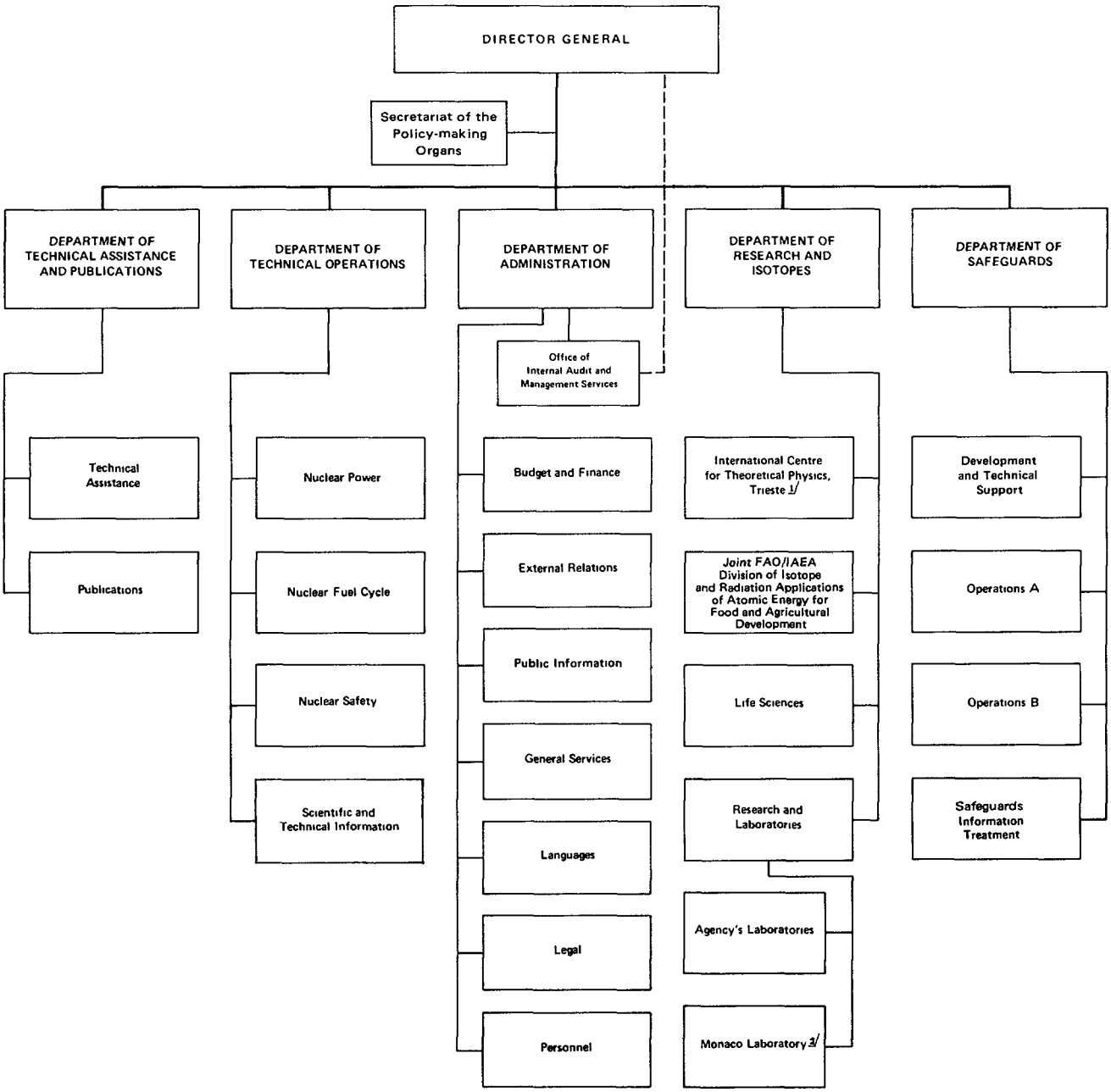
| | | |
|---|---|---|
| 15. | Symposium on recent advances in nuclear materials safeguards | L.2/7 and H.2.3/4 |
| 16. | Safeguards workshop seminar | L.3/11 |

Information and technical services

| | | |
|---|---|---|
| 17. | INIS/AGRIS training seminar | M.1/13 |

ANNEX III

## ORGANIZATIONAL CHART




1/ Jointly operated by the Agency and UNESCO.
2/ With the participation of UNESCO and UNEP.

ANNEX IV

# THE MANNING TABLE

## Manning Table for 1981

Table 1

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Office of the Director General | 1 | – | 1 | 1 | 1 | – | 1 | – | 5 | 5 | – | 10 |
| Secretariat of the Policy-making Organs | – | – | 1 | 1 | – | – | 1 | – | 3 | 2 | – | 5 |
| Department of Technical Assistance and Publications | – | 1 | – | 1 | 3 | – | 1 | – | 6 | 7 | – | 13 |
| Division of Technical Assistance | – | – | 1 | 8 | 8 | 8 | 4 | – | 29 | 37 | – | 66 |
| Division of Publications | – | – | 1 | 1 | 1 | 4 | 6 | 1 | 14 | 112 | 19 | 145 |
| Department of Technical Operations | – | 1 | – | – | – | 1 | – | 1 | 3 | 2 | – | 5 |
| Unit for Peaceful Nuclear Explosions Services | – | – | – | 1 | – | – | – | – | 1 | – | – | 1 |
| Division of Nuclear Power | – | – | 1 | 9 | 7 | 4 | 1 | – | 22 | 13 | – | 35 |
| Nuclear Fuel Cycle Division | – | – | 1 | 7 | 12 | – | – | – | 20 | 12 | – | 32 |
| Division of Nuclear Safety | – | – | 1 | 12 | 10 | 3 | – | – | 26 | 20 | – | 46 |
| Division of Scientific and Technical Information | – | – | 1 | 5 | 10 | 15 | 4 | 2 | 37 | 80 | – | 117 |
| Department of Research and Isotopes | – | 1 | – | – | 1 | – | 1 | – | 3 | 2 | – | 5 |
| Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development | – | – | – | 8 | 6 | 1 | 1 | – | 16 | 8 | – | 24 |
| Division of Life Sciences | – | – | 1 | 5 | 5 | 1 | – | – | 12 | 10 | – | 22 |
| Division of Research and Laboratories | – | – | 1 | 6 | 11 | 7 | 3 | – | 28 | 18 | – | 46 |
| The Agency's Laboratory | – | – | – | 4 | 11 | 6 | 3 | 1 | 25 | 60 | 27 | 112 |
| The Monaco Laboratory | – | – | – | 2 | 3 | 1 | – | 3 | 9 | 14 | – | 23 |
| International Centre for Theoretical Physics | – | – | – | 1 | 2 | 2 | – | – | 5 | 17 | – | 22 |
| Department of Safeguards | – | 1 | – | 6 | 8 | 3 | – | – | 18 | 19 | – | 37 |
| Division of Development and Technical Support | – | – | 1 | 13 | 16 | 2 | – | – | 32 | 21 | – | 53 |
| Division of Operations A | – | – | 1 | 11 | 27 | 22 | – | – | 61 | 21 | – | 82 |
| Division of Operations B | – | – | 1 | 13 | 41 | 32 | – | – | 87 | 26 | – | 113 |
| Division of Safeguards Information Treatment | – | – | 1 | 8 | 11 | 3 | – | – | 23 | 46 | – | 69 |
| Department of Administration | – | 1 | – | 1 | – | – | 1 | – | 3 | 3 | – | 6 |
| Office of Internal Audit and Management | – | – | – | 1 | 1 | 2 | 1 | – | 5 | 4 | – | 9 |
| Division of Budget and Finance | – | – | 1 | 4 | 6 | 8 | 3 | 2 | 24 | 43 | – | 67 |
| Division of General Services | – | – | 1 | 2 | 3 | 1 | 1 | – | 8 | 69 | 30 | 107 |
| Division of External Relations | – | – | 2 | 5 | 6 | 4 | 4 | – | 21 | 21 | – | 42 |
| Division of Public Information | – | – | 1 | – | 1 | 1 | 1 | – | 4 | 7 | – | 11 |
| Division of Languages | – | – | 1 | 4 | 11 | 23 | – | – | 39 | 37 | 1 | 77 |
| Legal Division | – | – | 1 | 3 | 2 | 1 | – | – | 7 | 4 | – | 11 |
| Division of Personnel | – | – | 1 | 2 | 5 | 3 | – | – | 11 | 34 | 3 | 48 |
| TOTAL | 1 | 5 | 22 | 145 | 229 | 158 | 37 | 10 | 607 | 774 | 80 | 1 461 |

## Summary of Manpower by Grade of Post and by Department

Table 1.a

| Grade of post | Number of established posts | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1979 Adjusted | 1980 | 1980 Adjusted | Change | 1981 | 1982 Preliminary estimate | 1983 Preliminary estimate |
| DG | 1 | 1 | 1 | – | 1 | 1 | 1 |
| DDG | 5 | 5 | 5 | – | 5 | 5 | 5 |
| D | 21 | 21 | 21 | 1 | 22 | 22 | 22 |
| P-5 | 133 | 138 | 138 | 7 | 145 | 146 | 147 |
| P-4 | 215 | 223 | 223 | 6 | 229 | 237 | 245 |
| P-3 | 144 | 153 | 153 | 5 | 158 | 159 | 162 |
| P-2 | 39 | 41 | 41 | (4) | 37 | 39 | 39 |
| P-1 | 11 | 10 | 10 | – | 10 | 10 | 10 |
| Sub-total | 569 | 592 | 592 | 15 | 607 | 619 | 631 |
| GS | 718 | 756 | 756 | 18 | 774 | 803 | 817 |
| M&O | 168 | 80 | 80 | – | 80 | 80 | 82 |
| TOTAL | 1 455 | 1 428 | 1 428 | 33 | 1 461 | 1 502 | 1 530 |
| Department: | | | | P GS | | | |
| Office of the Director General | 14 | 15 | 15 | – – | 15 | 15 | 15 |
| Department of Technical Assistance and Publications | 215 | 219 | 222 | – 2 | 224 | 235 | 243 |
| Department of Technical Operations | 227 | 232 | 235 | – 1 | 236 | 243 | 245 |
| Department of Research and Isotopes | 254 | 255 | 254 | – – | 254 | 254 | 255 |
| Department of Safeguards | 282 | 322 | 324 | 15 15 | 354 | 370 | 384 |
| Department of Administration | 463 | 385 | 378 | – – | 378 | 385 | 388 |
| TOTAL | 1 455 | 1 428 | 1 428 | 15 18 | 1 461 | 1 502 | 1 530 |

## New posts for 1981

Table 2

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Department of Technical Assistance and Publications | | | | | | | | | | | | |
| Division of Technical Assistance | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| Division of Publications | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| Department of Technical Operations | | | | | | | | | | | | |
| Division of Scientific and Technical Information | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| Department of Safeguards | – | – | – | – | 1 | – | – | – | 1 | 4 | – | 5 |
| Division of Development and Technical Support | – | – | – | 2 | 1 | – | – | – | 3 | 4 | – | 7 |
| Division of Operations A | – | – | – | 1 | 2 | 1 | – | – | 4 | 1 | – | 5 |
| Division of Operations B | – | – | – | 1 | 4 | 1 | – | – | 6 | 2 | – | 8 |
| Division of Safeguards Information Treatment | – | – | – | 1 | – | – | – | – | 1 | 4 | – | 5 |
| TOTAL | – | – | – | 5 | 8 | 2 | – | – | 15 | 18 | – | 33 |

## ADDITIONAL PROFESSIONAL POSTS IN 1981

Department of Safeguards (1 P-4)

The growth in the scope of the work of the Department of Safeguards and the increasing sophistication of its activities call for new, more complex management methods and centralized, co-ordinated and systematic planning based on the collection and analysis of managerial data. For this purpose the Section for Standardization and Administrative Support requires one additional Professional officer (at the P-4 level) to design, develop and administer a safeguards management planning system.

Division of Development and Technical Support (2 P-5, 1 P-4)

An additional Professional officer (at the P-5 level) is needed for the co-ordination of training activities in the Department of Safeguards (including the analysis of training needs, the organization of training courses, lecturing, and the evaluation of training effectiveness) in the light of the growing number of inspectors, the increase in inspector turnover, the need to retrain inspectors, the incorporation of new equipment and the expectation that higher standards of training will offset to some extent the existing shortage of inspectors.

Owing to the increasing involvement of the Section for System Studies in the development of methodology for safeguards evaluation and in improving safeguards system design and implementation, an additional Professional officer (at the P-5 level) will be needed to conduct and participate in studies on evaluating the effectiveness of nuclear fuel cycle safeguards; to initiate and co-ordinate inter-divisional efforts, programmes of assistance to Member States and international advisory groups designed to solve safeguards implementation problems; and to participate in other safeguards system studies.

One additional Professional officer (at the P-4 level) is needed for the Section for Development of Instruments, Methods and Techniques to provide expertise in the development, acquisition and testing of containment and surveillance instrumentation and in the development of criteria for the application of specific instruments in specified locations.

Divisions of Operations (2 P-5, 6 P-4, 2 P-3)

The additional Professional staff requirements of the Divisions of Operations, which result directly from the Agency's safeguards obligations, have been determined as follows: the inspection effort in man-days per annum has been calculated for each nuclear facility or accountability area subject to safeguards and the total manpower needs then estimated with allowance for travel, discussions with local authorities and time spent at Headquarters in preparing and reporting on inspections, preparing subsidiary arrangements and facility attachments, working out specific safeguards implementation practices and performing country officer duties and other tasks. The posting of resident inspectors at certain bulk-handling facilities is foreseen, and this has kept the requirements below that they would otherwise have been.

Division of Safeguards Information Treatment (1 P-5)

A senior, computer-oriented statistician (at the P-5 level) is needed in the Section for Data Evaluation Services to help in coping with the difficult inspection data evaluation problems which are being encountered.

| | |
|---|---|
| TOTAL | 15 |

## ADDITIONAL GS POSTS IN 1981

Division of Technical Assistance (1 GS)

One additional GS post is required in the Fellowships and Training Section to support the programme evaluation activities.

Division of Publications (1 GS)

One additional GS post is needed to regularize the temporary assistance situation of a technical draughtsman employed since 1978.

Division of Scientific and Technical Information (1 GS)

An additional GS post is needed in the Director's Office for an administrative assistant.

Department of Safeguards (4 GS)

The Office of the Deputy Director General requires an additional GS post for secretarial and clerical support as the workload connected with travel has increased with the growth of the Department.

Two additional GS posts are required in the Safeguards Evaluation Section: one for a clerk to assist in the collection of data related to safeguards effectiveness and in the documentation of evaluation procedures and their application, and one for a clerk to perform routine calculations and assist in the preparation of periodic reports.

The Section for Standardization and Administrative Support requires a GS post for a senior clerk to assist in statistical and clerical tasks related to the planning and implementation of safeguards.

Division of Development and Technical Support (4 GS)

An additional GS post is needed in the Section for System Studies for a clerk who would, in particular, assist in evaluating inspection activities and in collecting safeguards data necessary for the analysis of safeguards implementation in different nuclear fuel cycles.

An additional GS post is needed in the Section for Development of Instruments, Methods and Techniques for a technician to perform instrument tests at Headquarters and to co-ordinate the in-field tests performed by other personnel; the technician would also participate in demonstrations of new equipment for staff in the Divisions of Operations.

The Section for Technical Services needs an additional GS post in the NDA area owing to the overall increase in the safeguards workload and to the continuing trend towards high-resolution spectroscopy, which – while giving better results – requires more time for detector calibration and equipment maintenance.

An additional GS post is required in the Section for Technical Services for a technician to implement optical (particularly video) surveillance equipment at facilities under Agency safeguards.

Divisions of Operations (3 GS)

Three additional GS posts are required in order to maintain the number of Professional posts to one GS post at the present level, which experience has shown to be appropriate (1 GS for Operations A, 2 GS for Operations B).

Division of Safeguards Information Treatment (4 GS)

An additional GS post is necessary for a secretary who would serve the Division as a whole and in particular the Section for Data Processing Development.

Two additional safeguards clerks are needed in the Section for Data Processing Operations to deal with the growing number of accounting and inspection records to be processed.

The Section for Data Evaluation Services requires an additional GS post for a safeguards evaluation clerk.

TOTAL 18

Reclassification of existing posts

Table 3

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Department of Technical Operations | | | | | | | | | | | | |
| Nuclear Fuel Cycle Division | – | – | 1 | (1) | – | – | – | – | – | – | – | – |
| Division of Nuclear Safety | – | – | – | 2 | (1) | – | (1) | – | – | – | – | – |
| Division of Scientific and Technical Information | – | – | – | 1 | (1) | 1 | (1) | – | – | – | – | – |
| Department of Administration | | | | | | | | | | | | |
| Division of Budget and Finance | – | – | – | – | – | 2 | (2) | – | – | – | – | – |
| TOTAL | – | – | 1 | 2 | (2) | 3 | (4) | – | – | – | – | – |

## RECLASSIFICATIONS OF PROFESSIONAL POSTS IN 1981

Nuclear Fuel Cycle Division
One P-5 to D-1 (Director of a new Division) (1 D-1)

In connection with the reorganization of the Department of Technical Operations, which involves the establishment of an additional Division within the Department, one additional D-1 post is needed. It is accordingly necessary to upgrade an existing P-5 post of the "Waste Management" sub-programme of the new "Nuclear Fuel Cycle" programme.

Division of Nuclear Safety and Environmental Protection
One P-4 to P-5 (Head, Radiological Protection Service Section) (1 P-5)

To ensure efficient radiation protection for all Agency personnel who, in the performance of their duties, are exposed to ionizing radiation, a Radiation Protection Service Section has been established. The Section has been manned using existing posts, so that no additional manpower is required. The Section Head supervises the whole radiological surveillance programme at the Agency's laboratories and the provision of radiation protection services to all radiation workers in the Agency, co-ordinates radiation protection training and advises on radiation protection aspects of the design and operation of facilities. The responsibilities and duties assigned to the Section Head exceed those commonly associated with a P-4 grade, which is considered inadequate.

One P-2 to P-5 (Senior Nuclear Safety Specialist) (1 P-5)

The supplementary nuclear power safety activities approved in 1979 have been incorporated into the 1981 Regular Programme. The expanded safety programme includes substantially more activities relating to the development of safety codes and guides, in particular efforts to promote the international use of the guidance contained in these documents through safety advisory missions. Additional activities include the development of an emergency assistance plan for nuclear accidents, the co-ordination of safety research and greater involvement in safety training courses. An extra Professional officer (at the P-5 level) is required in the Nuclear Safety Section for the duties in question and a redundant post is transferred from the Division of Nuclear Power. Since this post is only at the P-2 level, a reclassification is required.

Division of Scientific and Technical Information

One P-4 to P-5 (Head, Library) (1 P-5)

With the establishment of a common library at the VIC serving – in addition to the Agency and its Member States – UNIDO, UNRWA and the other United Nations organizations based in Vienna, the level of responsibility and the duties of the Head of the Library have increased substantially. The scope of the library-based information and documents service has been extended considerably and requires the introduction of more complex procedures and techniques so as to make the Library more responsive to users' requirements. Taken together, the increased collection size, budget and manpower of the Library have added a new dimension to the Library Head's technical and management functions. As a consequence, the grading of his post at the P-4 level is no longer considered appropriate.

One P-2 to P-3 (Computer Programme Librarian) (1 P-3)

The incumbent works in Paris as liaison officer at the NEA Data Bank, with which the Agency collaborates in the provision of computer program and neutron data exchange services. There has been an increase in the number of nuclear establishments in Member States taking advantage of these services and the scope of the services has been extended to include activities such as assistance in implementing programs at computer installations in Member States. This, combined with the enhanced sophistication of programming techniques, has increased considerably the level of responsibility of the Computer Programme Librarian. The present grading of the post is no longer in line with the responsibilities and duties of the incumbent and does not correspond to the post grading of comparable NEA staff.

Division of Budget and Finance

One P-2 to P-3 (Supervisor, Technical Assistance Unit) (1 P-3)

The incumbent supervises the unit which deals with all financial aspects of technical assistance. The work has increased not only in volume, due to the expansion of technical assistance, but also in complexity, because of – inter alia – changes in the UNDP reporting and accounting system, the separate identification of convertible and non-convertible currency resources, and the receipt of project funding from new sources. The present grading of this post, which carries key responsibilities in the financial management of technical assistance, is not considered appropriate.

One P-2 to P-3 (Supervisor, Claims Unit) (1 P-3)

The incumbent supervises the unit which deals with all financial claims. Over the years there has been a steady increase in the number of claims and this has necessitated the establishment of improved procedures and control mechanisms to ensure their proper handling. In addition, the introduction of a new computer accounting system, the establishment of common services at the VIC and the creation of special funds have considerably increased the complexity and difficulty of the incumbent's work. The present grading of this post is not in line with the increased responsibilities and duties of the incumbent or with the grading of similar posts in other organizations.

## Adjusted Manning Table for 1980

Table 4

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Office of the Director General | 1 | – | 1 | 1 | 1 | – | 1 | – | 5 | 5 | – | 10 |
| Secretariat of the Policy-making Organs | – | – | 1 | 1 | – | – | 1 | – | 3 | 2 | – | 5 |
| Department of Technical Assistance and Publications | – | 1 | – | 1 | 3 | – | 1 | – | 6 | 7 | – | 13 |
| Division of Technical Assistance | – | – | 1 | 8 | 8 | 8 | 4 | – | 29 | 36 | – | 65 |
| Division of Publications | – | – | 1 | 1 | 1 | 4 | 6 | 1 | 14 | 111 | 19 | 144 |
| Department of Technical Operations | – | 1 | – | – | – | 1 | – | 1 | 3 | 2 | – | 5 |
| Unit for Peaceful Nuclear Explosions Services | – | – | – | 1 | – | – | – | – | 1 | – | – | 1 |
| Division of Nuclear Power | – | – | 1 | 9 | 7 | 4 | 1 | – | 22 | 13 | – | 35 |
| Nuclear Fuel Cycle Division | – | – | – | 8 | 12 | – | – | – | 20 | 12 | – | 32 |
| Division of Nuclear Safety | – | – | 1 | 10 | 11 | 3 | 1 | – | 26 | 20 | – | 46 |
| Division of Scientific and Technical Information | – | – | 1 | 4 | 11 | 14 | 5 | 2 | 37 | 79 | – | 116 |
| Department of Research and Isotopes | – | 1 | – | – | 1 | – | 1 | – | 3 | 2 | – | 5 |
| Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development | – | – | – | 8 | 6 | 1 | 1 | – | 16 | 8 | – | 24 |
| Division of Life Sciences | – | – | 1 | 5 | 5 | 1 | – | – | 12 | 10 | – | 22 |
| Division of Research and Laboratories | – | – | 1 | 6 | 11 | 7 | 3 | – | 28 | 18 | – | 46 |
| The Agency's Laboratory | – | – | – | 4 | 11 | 6 | 3 | 1 | 25 | 60 | 27 | 112 |
| The Monaco Laboratory | – | – | – | 2 | 3 | 1 | – | 3 | 9 | 14 | – | 23 |
| International Centre for Theoretical Physics | – | – | – | 1 | 2 | 2 | – | – | 5 | 17 | – | 22 |
| Department of Safeguards | – | 1 | – | 6 | 7 | 3 | – | – | 17 | 15 | – | 32 |
| Division of Development and Technical Support | – | – | 1 | 11 | 15 | 2 | – | – | 29 | 17 | – | 46 |
| Division of Operations A | – | – | 1 | 10 | 25 | 21 | – | – | 57 | 20 | – | 77 |
| Division of Operations B | – | – | 1 | 12 | 37 | 31 | – | – | 81 | 24 | – | 105 |
| Division of Safeguards Information Treatment | – | – | 1 | 7 | 11 | 3 | – | – | 22 | 42 | – | 64 |
| Department of Administration | – | 1 | – | 1 | – | – | 1 | – | 3 | 3 | – | 6 |
| Office of Internal Audit and Management | – | – | – | 1 | 1 | 2 | 1 | – | 5 | 4 | – | 9 |
| Division of Budget and Finance | – | – | 1 | 4 | 6 | 6 | 5 | 2 | 24 | 43 | – | 67 |
| Division of General Services | – | – | 1 | 2 | 3 | 1 | 1 | – | 8 | 69 | 30 | 107 |
| Division of External Relations | – | – | 2 | 5 | 6 | 4 | 4 | – | 21 | 21 | – | 42 |
| Division of Public Information | – | – | 1 | – | 1 | 1 | 1 | – | 4 | 7 | – | 11 |
| Division of Languages | – | – | 1 | 4 | 11 | 23 | – | – | 39 | 37 | 1 | 77 |
| Legal Division | – | – | 1 | 3 | 2 | 1 | – | – | 7 | 4 | – | 11 |
| Division of Personnel | – | – | 1 | 2 | 5 | 3 | – | – | 11 | 34 | 3 | 48 |
| TOTAL | 1 | 5 | 21 | 138 | 223 | 153 | 41 | 10 | 592 | 756 | 80 | 1 428 |

Proposed changes in 1980

Table 5

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Department of Technical Assistance and Publications | – | – | – | – | 1 | (1) | – | – | – | – | – | – |
| Division of Technical Assistance | – | – | – | – | (1) | 1 | – | – | – | – | – | – |
| Division of Publications | – | – | – | – | – | (1) | – | – | (1) | – | 4 | 3 |
| Department of Technical Operations | | | | | | | | | | | | |
| Unit for Peaceful Nuclear Explosions Services | – | – | – | – | – | – | – | – | – | (1) | – | (1) |
| Division of Nuclear Power | – | – | – | (2) | (7) | – | (1) | – | (10) | (4) | – | (14) |
| Nuclear Fuel Cycle Division | – | – | – | 8 | 12 | – | – | – | 20 | 12 | – | 32 |
| Division of Nuclear Safety | – | – | – | (6) | (5) | – | 1 | – | (10) | (6) | – | (16) |
| Division of Scientific and Technical Information | – | – | – | – | – | 1 | 1 | – | 2 | – | – | 2 |
| Department of Research and Isotopes | – | – | – | (1) | 1 | – | – | – | – | – | – | – |
| Division of Life Sciences | – | – | – | – | (1) | – | (1) | – | (2) | – | – | (2) |
| The Agency's Laboratory | – | – | – | 1 | (1) | – | – | (1) | (1) | – | 2 | 1 |
| The Monaco Laboratory | – | – | – | (1) | 1 | – | – | 1 | 1 | (1) | – | – |
| Department of Safeguards | – | – | – | 1 | – | 1 | – | – | 2 | – | – | 2 |
| Department of Administration | – | – | – | – | – | – | – | – | – | 1 | – | 1 |
| Division of Budget and Finance | – | – | – | – | (1) | 2 | (1) | – | – | – | – | – |
| Division of General Services | – | – | – | – | – | (1) | – | – | (1) | (1) | (9) | (11) |
| Division of External Relations | – | – | – | – | (1) | (1) | 1 | – | (1) | – | – | (1) |
| Division of Public Information | – | – | – | – | 1 | (1) | – | – | – | – | – | – |
| Division of Languages | – | – | – | – | – | 1 | – | – | 1 | – | – | 1 |
| Division of Personnel | – | – | – | – | 1 | (1) | – | – | – | – | 3 | 3 |
| TOTAL | – | – | – | – | – | – | – | – | – | – | – | – |

In order to make use of available Manning Table posts, following the annual survey on manpower requirements the Director General has approved a number of transfers of posts within the Secretariat. The explanations are given below.

- One P-3 post and one P-4 post are exchanged between the Office of the Deputy Director General for Technical Assistance and Publications (Programme Co-ordination Section) and the Division of Technical Assistance.
- Since it is planned to reduce the Agency's publishing activities, one P-3 editor post is transferred from the Division of Publications to the Division of Scientific and Technical Information. The post is required in the Computer Section for a systems analyst/project leader, in the Administrative Information Systems Group, for software development for the Technical Assistance, Administration and General Services programmes.
- Four M&O posts in the Division of General Services, in areas where the functions have been taken over by the United Nations or UNIDO, are transferred to the Division of Publications for the Common Printing Services.
- One GS post from the Unit for Peaceful Nuclear Explosions Services is transferred to the Division of Nuclear Safety. With the incorporation of the supplementary nuclear power safety programme into the 1981 Regular Programme and the resulting increase in the workload of the Nuclear Safety Section, an additional GS post is needed in the Section.
- One P-2 post not required in the Division of Nuclear Power is transferred to the Division of Nuclear Safety. Justification for the reclassification of this post to meet the requirements of the programme is given under "Reclassification of Professional posts in 1981".
- With the reorganization of the Department of Technical Operations, 11 Professional posts (6 at the P-5 and 5 at the P-4 level) and seven GS posts from the Division of Nuclear Safety and Environmental Protection, and nine Professional posts (2 at the P-5 and 7 at the P-4 level) and five GS posts from the Division of Nuclear Power and Reactors, are being transferred to the newly established Nuclear Fuel Cycle Division.

- One GS post no longer required in the Laboratory for the Metrology sub-programme owing to organizational changes is transferred to the Division of Nuclear Power and Reactors, where an additional GS post is required in the Nuclear Materials and Fuel Cycle Section for a clerk to carry out activities relating to new fuel cycle concepts, spent fuel management and technical assistance requests (this is one of the five GS posts being transferred from the Division of Nuclear Power and Reactors to the newly established Nuclear Fuel Cycle Division).

- One P-5 post from the Office of the Deputy Director General for Research and Isotopes and one P-3 post from the Division of General Services are transferred to the Department of Safeguards for the Safeguards Evaluation Section. Two Professional officers are needed in the Safeguards Evaluation Section to replace two part-time cost-free experts and one borrowed staff member who have been engaged in devising and testing systematic methods for the evaluation of safeguards effectiveness: the P-5 post incumbent to deal with documentation difficulties and persistent problems as they occur during the implementation of Agency safeguards, including problems connected with the interrelationship between facilities in a State's nuclear fuel cycle, and to generate periodic reports on the practical effects of those difficulties and problems and on potential remedies; and the P-3 post incumbent to conduct comprehensive reviews of safeguards procedures at each type of facility, to determine the continuing adequacy of safeguards concepts, to formulate recommendations and to document follow-up actions taken.

- One P-4 post from the Dosimetry Section of the Division of Life Sciences is transferred to the Office of the Deputy Director General for Research and Isotopes, for strengthening the support to regional co-operative agreements.

- One P-2 post from the Health-related Environmental Research Section of the Division of Life Sciences is transferred to the Computer Section, Division of Scientific and Technical Information, for software development, including the development of software for the Energy Data Bank.

- One P-4 post and one P-1 post from the Laboratory are exchanged for a P-5 post and a GS post from the Monaco Laboratory.

- Two M&O posts are transferred from the Division of General Services to the Laboratory.

- One GS post is transferred from the Division of General Services to the Office of the Deputy Director General for Administration.

In order to accommodate as far as possible post reclassifications within the Department of Administration recommended by the Ad Hoc Group on the Reclassification of Professional Posts, several transfers of posts are made:

- A P-2 post in the Division of Budget and Finance is exchanged for a P-3 post in the Division of External Relations, for the upgrading of the Head of the Payroll Section;

- A P-4 post in the Division of Budget and Finance is transferred to the Division of Public Information in exchange for a P-3 post, for the upgrading of a Public Information Officer's post.

- For the upgrading of the post of a Medical Officer in the Joint Medical Service (Division of Personnel) from the P-3 to the P-4 level, one P-4 post is transferred from the Interpretation Section, Division of External Relations, to the Joint Medical Service and a P-3 post in the Joint Medical Service is transferred to the French Translation Section, Division of Languages.

- Three M&O posts for cleaning staff were transferred from the Division of General Services to the Division of Personnel, for the cleaning of the Joint Medical Service premises.

Preliminary Manning Table for 1982

Table 6

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Office of the Director General | 1 | – | 1 | 1 | 1 | – | 1 | – | 5 | 5 | – | 10 |
| Secretariat of the Policy-making Organs | – | – | 1 | 1 | – | – | 1 | – | 3 | 2 | – | 5 |
| Department of Technical Assistance and Publications | – | 1 | – | 1 | 3 | – | 1 | – | 6 | 7 | – | 13 |
| Division of Technical Assistance | – | – | 1 | 8 | 8 | 8 | 5 | – | 30 | 40 | – | 70 |
| Division of Publications | – | – | 1 | 1 | 1 | 4 | 6 | 1 | 14 | 119 | 19 | 152 |
| Department of Technical Operations | – | 1 | – | – | – | 1 | – | 1 | 3 | 2 | – | 5 |
| Unit for Peaceful Nuclear Explosions Services | – | – | – | 1 | – | – | – | – | 1 | – | – | 1 |
| Division of Nuclear Power | – | – | 1 | 9 | 7 | 4 | 1 | – | 22 | 13 | – | 35 |
| Nuclear Fuel Cycle Division | – | – | 1 | 7 | 12 | – | – | – | 20 | 12 | – | 32 |
| Division of Nuclear Safety | – | – | 1 | 13 | 10 | 3 | – | – | 27 | 20 | – | 47 |
| Division of Scientific and Technical Information | – | – | 1 | 5 | 11 | 15 | 5 | 2 | 39 | 84 | – | 123 |
| Department of Research and Isotopes | – | 1 | – | – | 1 | – | 1 | – | 3 | 2 | – | 5 |
| Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development | – | – | – | 7 | 6 | 1 | 1 | – | 15 | 8 | – | 23 |
| Division of Life Sciences | – | – | 1 | 5 | 5 | 1 | – | – | 12 | 10 | – | 22 |
| Division of Research and Laboratories | – | – | 1 | 6 | 11 | 7 | 3 | – | 28 | 18 | – | 46 |
| The Agency's Laboratory | – | – | – | 4 | 11 | 6 | 3 | 1 | 25 | 60 | 27 | 112 |
| The Monaco Laboratory | – | – | – | 2 | 3 | 1 | – | 3 | 9 | 15 | – | 24 |
| International Centre for Theoretical Physics | – | – | – | 1 | 2 | 2 | – | – | 5 | 17 | – | 22 |
| Department of Safeguards | – | 1 | – | 6 | 9 | 3 | – | – | 19 | 20 | – | 39 |
| Division of Development and Technical Support | – | – | 1 | 13 | 17 | 2 | – | – | 33 | 22 | – | 55 |
| Division of Operations A | – | – | 1 | 11 | 28 | 22 | – | – | 62 | 23 | – | 85 |
| Division of Operations B | – | – | 1 | 14 | 43 | 33 | – | – | 91 | 28 | – | 119 |
| Division of Safeguards Information Treatment | – | – | 1 | 8 | 12 | 3 | – | – | 24 | 48 | – | 72 |
| Department of Administration | – | 1 | – | 1 | – | – | 1 | – | 3 | 3 | – | 6 |
| Office of Internal Audit and Management | – | – | – | 1 | 1 | 2 | 1 | – | 5 | 4 | – | 9 |
| Division of Budget and Finance | – | – | 1 | 4 | 7 | 8 | 3 | 2 | 25 | 46 | – | 71 |
| Division of General Services | – | – | 1 | 2 | 3 | 1 | 1 | – | 8 | 69 | 30 | 107 |
| Division of External Relations | – | – | 2 | 5 | 6 | 4 | 4 | – | 21 | 22 | – | 43 |
| Division of Public Information | – | – | 1 | – | 1 | 1 | 1 | – | 4 | 7 | – | 11 |
| Division of Languages | – | – | 1 | 4 | 11 | 23 | – | – | 39 | 37 | 1 | 77 |
| Legal Division | – | – | 1 | 3 | 2 | 1 | – | – | 7 | 4 | – | 11 |
| Division of Personnel | – | – | 1 | 2 | 5 | 3 | – | – | 11 | 36 | 3 | 50 |
| TOTAL | 1 | 5 | 22 | 146 | 237 | 159 | 39 | 10 | 619 | 803 | 80 | 1 502 |

## Preliminary Manning Table for 1983

Table 7

| | DG | DDG | D | P-5 | P-4 | P-3 | P-2 | P-1 | Sub-total | GS | M&O | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Office of the Director General | 1 | – | 1 | 1 | 1 | – | 1 | – | 5 | 5 | – | 10 |
| Secretariat of the Policy-making Organs | – | – | 1 | 1 | – | – | 1 | – | 3 | 2 | – | 5 |
| Department of Technical Assistance and Publications | – | 1 | – | 1 | 3 | – | 1 | – | 6 | 7 | – | 13 |
| Division of Technical Assistance | – | – | 1 | 8 | 8 | 9 | 5 | – | 31 | 42 | – | 73 |
| Division of Publications | – | – | 1 | 1 | 1 | 4 | 6 | 1 | 14 | 122 | 21 | 157 |
| Department of Technical Operations | – | 1 | – | – | – | 1 | – | 1 | 3 | 2 | – | 5 |
| Unit for Peaceful Nuclear Explosions Services | – | – | – | 1 | – | – | – | – | 1 | – | – | 1 |
| Division of Nuclear Power | – | – | 1 | 9 | 7 | 4 | 1 | – | 22 | 13 | – | 35 |
| Nuclear Fuel Cycle Division | – | – | 1 | 7 | 12 | – | – | – | 20 | 12 | – | 32 |
| Division of Nuclear Safety | – | – | 1 | 13 | 10 | 3 | – | – | 27 | 20 | – | 47 |
| Division of Scientific and Technical Information | – | – | 1 | 5 | 12 | 15 | 5 | 2 | 40 | 85 | – | 125 |
| Department of Research and Isotopes | – | 1 | – | – | 1 | – | 1 | – | 3 | 2 | – | 5 |
| Joint FAO/IAEA Division of Isotope and Radiation Applications of Atomic Energy for Food and Agricultural Development | – | – | – | 7 | 6 | 1 | 1 | – | 15 | 8 | – | 23 |
| Division of Life Sciences | – | – | 1 | 5 | 5 | 1 | – | – | 12 | 10 | – | 22 |
| Division of Research and Laboratories | – | – | 1 | 6 | 12 | 7 | 3 | – | 29 | 18 | – | 47 |
| The Agency's Laboratory | – | – | – | 4 | 11 | 6 | 3 | 1 | 25 | 60 | 27 | 112 |
| The Monaco Laboratory | – | – | – | 2 | 3 | 1 | – | 3 | 9 | 15 | – | 24 |
| International Centre for Theoretical Physics | – | – | – | 1 | 2 | 2 | – | – | 5 | 17 | – | 22 |
| Department of Safeguards | – | 1 | – | 6 | 9 | 4 | – | – | 20 | 21 | – | 41 |
| Division of Development and Technical Support | – | – | 1 | 14 | 18 | 2 | – | – | 35 | 23 | – | 58 |
| Division of Operations A | – | – | 1 | 11 | 30 | 23 | – | – | 65 | 24 | – | 89 |
| Division of Operations B | – | – | 1 | 14 | 45 | 33 | – | – | 93 | 29 | – | 122 |
| Division of Safeguards Information Treatment | – | – | 1 | 8 | 13 | 3 | – | – | 25 | 49 | – | 74 |
| Department of Administration | – | 1 | – | 1 | – | – | 1 | – | 3 | 3 | – | 6 |
| Office of Internal Audit and Management | – | – | – | 1 | 1 | 2 | 1 | – | 5 | 4 | – | 9 |
| Division of Budget and Finance | – | – | 1 | 4 | 7 | 8 | 3 | 2 | 25 | 49 | – | 74 |
| Division of General Services | – | – | 1 | 2 | 3 | 1 | 1 | – | 8 | 69 | 30 | 107 |
| Division of External Relations | – | – | 2 | 5 | 6 | 4 | 4 | – | 21 | 22 | – | 43 |
| Division of Public Information | – | – | 1 | – | 1 | 1 | 1 | – | 4 | 7 | – | 11 |
| Division of Languages | – | – | 1 | 4 | 11 | 23 | – | – | 39 | 37 | 1 | 77 |
| Legal Division | – | – | 1 | 3 | 2 | 1 | – | – | 7 | 4 | – | 11 |
| Division of Personnel | – | – | 1 | 2 | 5 | 3 | – | – | 11 | 36 | 3 | 50 |
| TOTAL | 1 | 5 | 22 | 147 | 245 | 162 | 39 | 10 | 631 | 817 | 82 | 1 530 |

# ANNEX V

## International Centre for Theoretical Physics

### Summary by items of expenditure

| Item of expenditure | 1979 Actual obligations | 1980 Adjusted budget | Increase or (decrease) from 1980 | | | 1981 Estimate | 1982 Preliminary estimate | 1983 Preliminary estimate |
|---|---|---|---|---|---|---|---|---|
| | | | Price | Programme | Total | | | |
| Salaries and wages | | | | | | | | |
| Established posts | 333 521 | 415 000 | 30 000 | – | 30 000 | 445 000 | 490 000 | 530 000 |
| Consultants | 45 986 | 28 000 | 2 000 | 41 000 | 43 000 | 71 000 | 78 000 | 85 000 |
| Overtime | 12 737 | 10 000 | 700 | (700) | – | 10 000 | 11 000 | 12 000 |
| Temporary assistance | 39 606 | 29 000 | 2 000 | 12 000 | 14 000 | 43 000 | 47 000 | 51 000 |
| | 431 850 | 482 000 | 34 700 | 52 300 | 87 000 | 569 000 | 626 000 | 678 000 |
| Common staff costs | 98 867 | 120 000 | 13 000 | – | 13 000 | 133 000 | 147 000 | 159 000 |
| Travel | 11 251 | 14 000 | 1 300 | (3 300) | (2 000) | 12 000 | 12 000 | 12 000 |
| Meetings | | | | | | | | |
| Conferences, *symposia, seminars* | 441 801 | 674 000 | 56 000 | (164 000) | (108 000) | 566 000 | 590 000 | 590 000 |
| Technical committees, advisory groups | 6 505 | 7 500 | 1 000 | – | 1 000 | 8 500 | 9 000 | 9 000 |
| Representation and hospitality | 9 473 | 8 500 | 1 000 | – | 1 000 | 9 500 | 10 000 | 10 000 |
| Common services, supplies and equipment | 335 612 | 352 000 | 38 000 | – | 38 000 | 390 000 | 448 000 | 502 000 |
| Other items of expenditure | 338 184 | 397 000 | 31 000 | (56 000) | (25 000) | 372 000 | 380 000 | 410 000 |
| Transfer of costs: | | | | | | | | |
| Printing and publishing services | 27 763 | 160 000 | 18 000 | 12 000 | 30 000 | 190 000 | 190 000 | 190 000 |
| TOTAL | 1 701 306 | 2 215 000 | 194 000 | (159 000) | 35 000 | 2 250 000 | 2 412 000 | 2 560 000 |
| Source of funds: | | | | | | | | |
| Regular Budget | 577 763 | 901 000 | 65 000 | – | 65 000 | 966 000 | 1 030 000 | 1 097 000 |
| Extrabudgetary resources (Table 5) | 1 123 543 | 1 314 000 | 129 000 | (159 000) | (30 000) | 1 284 000 | 1 382 000 | 1 463 000 |
| TOTAL | 1 701 306 | 2 215 000 | 194 000 | (159 000) | 35 000 | 2 250 000 | 2 412 000 | 2 560 000 |

# ANNEX VI

## Draft resolutions

### A. REGULAR BUDGET APPROPRIATIONS FOR 1981

The General Conference,

Accepting the recommendations of the Board of Governors relating to the Regular Budget of the Agency for 1981 [1],

1. Appropriates an amount of $88 677 000 for the Regular Budget expenses of the Agency in 1981 as follows:

| Section | | United States dollars |
|---|---|---|
| 1. | Technical assistance and training | 4 021 000 |
| 2. | Technical operations [2] | 15 228 000 |
| 3. | Research and isotopes [3] | 13 279 000 |
| 4. | Operational facilities [4] | 1 937 000 |
| 5. | Safeguards | 25 003 000 |
| 6. | Policy-making organs | 2 683 000 |
| 7. | Executive management and administration [5] | 10 110 000 |
| 8. | General services | 13 353 000 |
| 9. | Cost of work for others | 3 063 000 |
| | TOTAL | 88 677 000 |

2. Decides that the foregoing appropriation shall be financed as follows:

(a) $3 063 000 from income from work for others;

(b) $3 945 000 from other miscellaneous income; and

(c) $81 669 000 from contributions by Member States on the basis of the scale of assessment fixed by the General Conference in Resolution GC(XXIV)/RES/.....; and

3. Authorizes the Director General:

(a) To incur expenditures additional to those for which provision is made in the Regular Budget for 1981, provided that the relevant emoluments of any staff involved and all other costs are entirely financed from revenues arising out of sales, work performed for Member States or international organizations, research grants, special contributions or other sources extraneous to the Regular Budget for 1981; and

(b) With the prior approval of the Board of Governors, to make transfers between any of the Sections listed in paragraph 1 above.

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[1] See document GC(XXIV)/630, Table 2.

[2] For the financing of Nuclear power, Nuclear fuel cycle, Nuclear safety, Information and technical services and Nuclear explosions for peaceful purposes.

[3] For the financing of Food and agriculture, Life sciences and Physical sciences.

[4] For the financing of the International Centre for Theoretical Physics (in part) and the International Laboratory of Marine Radioactivity (in part).

[5] For the financing of Executive management and technical programme planning and Administration.

## B. TECHNICAL ASSISTANCE FUND ALLOCATION FOR 1981

The General Conference,

Accepting the recommendations of the Board of Governors relating to the Agency's technical assistance programme for 1981;

1. Decides that for 1981 the target for voluntary contributions to the Technical Assistance Fund shall be $13 million;

2. Notes that funds from other sources, estimated at $650 000, are expected to be available for that programme;

3. Allocates the amount of $13 650 000 for the Agency's technical assistance programme for 1981; and

4. Urges all Member States to make voluntary contributions for 1981 in accordance with Article XIV.F of the Statute, with paragraph 2 of its Resolution GC(V)/RES/100 as amended by Resolution GC(XV)/RES/286 or with paragraph 3 of the former Resolution, as appropriate.

## C. THE WORKING CAPITAL FUND IN 1981

The General Conference,

Accepting the recommendations of the Board of Governors relating to the Agency's Working Capital Fund in 1981 [1],

1. Approves a level of $2 million for the Agency's Working Capital Fund in 1981;

2. Decides that the Fund shall be financed, administered and used in 1981 in accordance with the relevant provisions of the Agency's Financial Regulations [2];

3. Authorizes the Director General to make advances from the Fund:

(a) Not exceeding $25 000 at any time, to finance temporarily projects or activities of a strictly self-liquidating character which will not necessitate an increase in the Fund in future years; and

(b) With the prior approval of the Board of Governors, unless in his opinion the situation requires immediate action before such approval can be obtained, to meet the cost incurred by the Agency in organizing and rendering emergency assistance to Member States in connection with radiation accidents, up to $50 000 in each case; and

4. Requests the Director General to submit to the Board statements of advances made from the Fund under the authority given in paragraph 3 above.

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[1] See document GC(XXIV)/630, para 41.
[2] INFCIRC/8/Rev.1 and Mod.1.