THE AGENCY'S PROGRAMME FOR 1977 - 82 AND BUDGET FOR 1977

GC(XX)/567

Printed by the
International Atomic Energy Agency
in Austria-August 1976

INTERNATIONAL ATOMIC ENERGY AGENCY

CONTENTS

ANNEXES

LIST OF ABBREVIATIONS

ACABQ	Advisory Committee on Administrative and Budgetary Questions of the General Assembly of the United Nations
AGRIS	Agricultural Information System
CCAQ	Consultative Committee on Administrative Questions
CINDA	Computer Index of Neutron Data
CMEA	Council for Mutual Economic Assistance
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
ERDA	United States Energy Research and Development Administration
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
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
IBRD	International Bank for Reconstruction and Development
ICAO	International Civil Aviation Organization
ICRISAT	International Crop Research Institute for the Semi-arid Tropics
ICRP	International Commission on Radiological Protection
ICRU	International Commission on Radiation Units and Measurements
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
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 Atomic Energy in Food and Agriculture
M&O	Maintenance and Operatives Service (staff)
MHD	Magnetohydrodynamics
Monaco Laboratory	International Laboratory of Marine Radioactivity at Monaco
NPT	Treaty on the Non-Proliferation of Nuclear Weapons (reproduced in document INFCIRC/140)
OECD(NEA)	Organisation for Economic Co-operation and Development (Nuclear Energy Agency)
OPEC	Organization of the Petroleum Exporting Countries
PAG	Protein and Calorie Advisory Group of the United Nations
PNE	Nuclear explosions for peaceful purposes
SABRAO	Society for the Advancement of Breeding Research in Asia and Oceania
SAC	Scientific Advisory Committee
SIDA	Swedish International Development Authority
Trieste Centre	International Centre for Theoretical Physics at Trieste
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNIPEDE	International Union of Producers and Distributors of Electrical Energy
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation

UPU	Universal Postal Union
US-AID	United States Agency for International Development
USDA	United States Department of Agriculture
WHO	World Health Organization
WMO	World Meteorological Organization

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 1977, the preliminary estimates for 1978 and the Agency's programme of work for the six-year period 1977-82. The Board requests the Conference to adopt the draft resolutions set forth in Annex VI.

2. The estimates for 1978 are based on conditions and trends as known now and are presented as preliminary estimates only. Final budget estimates for 1978 will be presented to the General Conference at its twenty-first 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. In compliance with proposals made by the governing bodies of the Agency for the improvement of the programme presentation by comparison with that in the previous six-year programme document (The Agency's Programme for 1975-80 and Budget for 1975[1]), the following changes have been made. The narrative has been shortened by avoiding presenting more than once what is essentially the same information regarding programmes, sub-programmes and programme components. A general revision of the formulation of the objectives has been made in such a way as to define more precisely the goals of a given activity, and wherever feasible the planned duration of programme components, or their parts, has been indicated. Additional information on co-ordinated research programmes has been provided under the plans for 1977-78. In the description of planned activities, reference is made to the relevant scientific meetings or co-ordinated research programmes in order to indicate more clearly how the Agency intends to achieve the proposed aims. In order to ensure better preparation for major scientific meetings - conferences and symposia - a list of such meetings is presented for the first time for a two-year period, that is 1977-78.

4. Apart from the above changes the structure and presentation of the six-year programme and of the budget estimates for 1977 and preliminary estimates for 1978 are essentially the same as in documents GC(XVIII)/526 and Mod. 1. As a further step towards the objective of showing in all cases the full costs attributable to each programme, the costs of laboratory services in support of other programmes are now included under "Food and agriculture", "Life sciences" and "Physical sciences".

5. In order to permit a meaningful comparison with the 1977 estimates, the actual obligations for 1975 and the adjusted budget for 1976 reflect the apportionment of the costs of services provided by the Laboratory.

Programme trends

6. It is proposed to increase the number of staff members engaged in technical assistance activities in order to cope efficiently with the expansion in those activities. Phases I and II of the nuclear power training courses will be continued in 1977 and 1978; by the latter year the total number of trainees since 1975 will amount to 400 for each of the two phases.

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[1] GC(XVIII)/526 and Mod. 1.

7. Under the "Food and agriculture" programme the work relating to plant breeding and genetics will be primarily concerned with the development of more efficient and economic systems for the induction, selection and utilization of mutations. With regard to insect and pest control, emphasis will be placed on achieving the most effective application of the sterile-insect technique against fruit flies. Research on the development of the sterile-insect technique for the eradication or control of the tsetse fly will be co-ordinated, with a view to permitting control programmes to be carried out in the field in 1979-80. In accordance with the plan of action worked out jointly with FAO and WHO, work will proceed with a view to securing wide acceptance of food preservation by irradiation.

8. Under the "Life sciences" programme the work will continue to comprise medicine, dosimetry and biology. The project on instrumentation requirements for nuclear medicine in developing countries will involve both the identification of the most important applications of nuclear medicine and the formulation of recommendations for the optimum design of instruments for such applications. Increased attention will be paid to environmental protection and accordingly a new sub-programme entitled "Health-related environmental research" is being initiated.

9. Under the "Physical sciences" programme the increase in Member States' research and development activities relating to fusion will be complemented by the Agency's efforts to facilitate international co-operation in this field. It is, therefore, planned to publish the journal "Nuclear Fusion" once per month instead of once every two months as from 1978. It is also planned to extend, for a trial period of two years, the nuclear data activities to cover atomic and molecular data of importance in thermonuclear fusion research and technology.

10. Solid-state physics and particle physics will represent a major part of the programme of the Trieste Centre, with greater emphasis being given to the former. In concert with UNESCO, selected activities will also be supported in applicable mathematics. In general, stress will be placed on those areas of physics and mathematics of more direct concern in energy matters as well as those related to applied research and development and to the environment.

11. For the "Nuclear power and reactors" programme emphasis will be increasingly placed on the provision of assistance to developing Member States in their efforts to introduce nuclear power and the development of a standardized form of presentation of the information required in order to make studies, on a global and regional basis, of the various problems which arise in the introduction and use of nuclear power. For the "Nuclear safety and environmental protection" programme efforts will be focused to an increasing extent on regulatory activities and in assisting Member States embarking on nuclear programmes in the establishment of regulatory systems and in the application of safety standards and recommendations.

12. The methods of assessing the role of nuclear power in comparison with that of other sources of energy, including cost trends in respect of the whole nuclear fuel cycle, will be improved, for example, by establishing a computerized bank of relevant data. For the purpose of evaluating uranium resources and demand, a computerized bank of data will also be established. Technical manuals will be prepared and task forces will be set up to assist Member States in the assessment of their indigenous uranium resources and the formulation of their uranium exploration policies. Depending on the availability of funds, training courses will be provided.

13. The environmental, economic and safety aspects of nuclear fuel cycle facilities will be examined in the context of the study of regional nuclear fuel cycle centres. The legal, organizational and financial aspects of such centres will also be studied. The results of all the studies of those centres will be summarized and presented to the Conference on Nuclear Power and its Fuel Cycle to be held in Salzburg from 2 to 12 May 1977.

14. The radiological safety standards and recommendations will continue to be kept up to date, and increased attention will be paid to the regulations concerning safety and physical protection in the transport of nuclear material. The work on the joint IAEA/IIASA research project on risk assessment will continue and will also involve co-operation by the Agency with IIASA and WHO in a project entitled "Comparison of Energy Options: A Methodological Study", which is partly financed by UNEP.

15. The work of reviewing the results of research on, and the experience gained in, the management of radioactive waste will be intensified. Particular attention will be given to the conditioning of high-level and alpha-bearing wastes, with special emphasis on encouraging the investigations of geological formations for their disposal. The environmental impact of the nuclear power industry and the procedures for establishing limits for releases of radioactive material to the environment will be the subject of continuing study, together with a continuing review of the Agency's responsibilities under the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention). Increasing attention will be given to the evaluation and measures for reducing the contribution of occupational exposure in the nuclear industry to the total population dose. The work on safety and reliability codes of practice and guides will gradually be expanded to cover not only additional types of nuclear power plants but also other facilities in the nuclear fuel cycle.

16. It is expected that the Conference on Nuclear Power and its Fuel Cycle will be of great international importance since it will concentrate on a comprehensive review of the technical and economic factors to be taken into account by policy-makers in the planning of nuclear power programmes. Particular attention will be given to the need to consider the nuclear fuel cycle in an integrated manner in relation to each individual nuclear power programme.

17. The INIS programme will concentrate on ensuring the quality of its output products and on assisting Member States to utilize them in the most effective way. The responsibility of achieving a smooth transfer to INIS of the information service provided up to now by Nuclear Science Abstracts, which will be discontinued in mid-1976, poses a challenge to the Agency in this field.

18. The main trend with regard to Agency safeguards will be the extension of their application to the entire range of facilities in the nuclear fuel cycle in an increasing number of States. This extension will affect both the volume and the nature of the work done. Special efforts will be made to ensure that the effectiveness of Agency safeguards keeps pace with the expansion of nuclear activities. The number of safeguards agreements so far concluded, both in connection with NPT and otherwise, is 129. Of those, all but 28 are with States that have or are planning to have significant, peaceful nuclear activities. It now appears to be the established policy of most, if not all, present and potential suppliers of items in the nuclear energy field to require the application of Agency safeguards in connection with such items, including those that are produced or constructed on the basis or by the use of technological information provided by them. As a result, Agency safeguards tend to be applied in connection with virtually all international supplies in the field of nuclear energy.

Adjustments made in the budget estimates and manning table for 1976

19. Here again, in order to permit a meaningful comparison with the 1977 estimates the "1976 Adjusted budget" column reflects in the case of the Laboratory a transfer of costs in support of other programmes to "Food and agriculture" ($853 000), "Life sciences" ($265 000) and "Physical sciences" ($1 118 000). The Regular Budget estimates for 1976 were based on an exchange rate of 18.50 Austrian schillings to the United States dollar. At the time the budget was approved for 1976, the average rate had fallen to 17.00 schillings to the dollar. In order to compensate for this loss the Board and the General Conference approved a special appropriation of $2.3 million as a part of the programme-budget adjustment of programme cost estimates for 1976.

20. Upon the establishment of a separate sub-programme entitled "Safeguards information treatment" two Professional posts and one GS post were transferred from the Division of Development and five Professional and three GS posts from the Division of Operations to the newly formed Unit for Safeguards Information Treatment. All other changes in the manning table represent shifts between programmes resulting from the continuing study on re-deployment of staff. All changes are within the overall approved manning table posts.

The Regular Budget for 1977

21. The total of the Regular Budget estimates for 1977 amounts to $43 501 000.

22. The Regular Budget estimates for 1977 are based on an exchange rate of 18.50 Austrian schillings to the United States dollar; they can, therefore, be compared directly with the 1976 programme estimates, which are also based on that rate. Because recent experience indicates greater stability of the dollar, no special appropriation is provided, as was done in 1976, to cover adjustment of programme cost estimates.

23. The Regular Budget estimates for 1977 include part of the total estimated cost at present foreseen for the Agency in respect of the transfer to its Permanent Headquarters. The total estimated cost is $4 850 000, of which $3 350 000 is provided in the Regular Budget estimates for 1977 and $1 500 000 is projected for appropriation in 1978.

24. The Board recommends that the cash surpluses in respect of 1974, 1975 and 1976 be used to meet the budgetary requirements of 1977 for the transfer of the Agency to its Permanent Headquarters and thus avoid an additional assessment on Member States.

25. As shown under "Source of funds" in Table 6 below, the programme budget for 1977 is $43 501 000, an increase of $8 799 000 over the programme budget for 1976 which includes costs totalling $3 350 000 in respect of the Agency's Permanent Headquarters.

26. As noted above, the Regular Budget for 1977 is also $43 501 000 since a special appropriation comparable to the $2 300 000 provided in 1976 for adjustment of programme cost estimates is not requested. Accordingly, the Regular Budget for 1977 provides for an increase of $6 499 000 or 17.6% over the Regular Budget for 1976. Of this increase, 2.2% is for price increases, 6.4% is for programme expansion, and 9.0% is for the expenses associated with the transfer of the Agency to its Permanent Headquarters.

27. The Regular Budget estimates for 1977 will be funded by (1) estimated income of $3 151 000, (2) cash surpluses in respect of 1974, 1975 and 1976 in a total amount of $3 350 000 and (3) an assessment on Member States of $37 000 000. The assessment on Member States for 1977 represents an increase of $2 763 000 or 8.1% over the assessment for 1976.

Target for voluntary contributions to the General Fund

28. The provision of technical assistance by the Agency to its developing Member States is financed largely from the General Fund, which receives its income mainly in the form of voluntary contributions for which a target is set each year. In 1975, the Board decided to propose an increase of $1 million in the target - from $4.5 million to $5.5 million.

29. During its deliberations in 1976 the Board recognized the needs of the developing countries for an increase of the voluntary contributions to the General Fund and accordingly recommends that the target for 1977 be established at $6 million.

Working Capital Fund

30. The Board recommends that for 1977 the Agency's Working Capital Fund remain at the same level as for 1976, namely $2 million. The recommendation is reflected in draft

resolution C in Annex VII. This level will be adequate to maintain the cash liquidity of the Agency only if Members pay their assessments promptly, as they have for the most part done this year.

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

31. 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. Consistent with a recommendation made by ACABQ, extrabudgetary resources available to the Agency are shown in Tables 4 and 5 below.

[2] INFCIRC/11, Part I.

THE CONSOLIDATED BUDGET

Table 1

Item	1975 Actual	1976 Adjusted	1977 Estimate
RECEIPTS			
Regular Budget			
Assessed contributions of Member States	26 309 822	34 237 000	37 000 000
Portion of 1974 assessments transferred to 1975 budget	800 000	-	-
Transfer of cash surplus	2 235 308	-	3 350 000
Miscellaneous income	2 947 680	2 765 000	3 151 000
General Fund			
Voluntary contributions	4 219 641	5 500 000	6 000 000
Miscellaneous income	118 733	150 000	100 000
Operating Fund I			
Special contributions by Member States	455 996	420 000	437 000
Direct contributions for special projects	637 960	758 000	682 000
Miscellaneous income	37 301	44 000	36 000
Addition to unobligated balance	(80 851)	-	-
Savings on prior years' operations	12 612	-	-
Operating Fund II			
Assessed programme costs	189 255	200 000	250 000
Miscellaneous income	17 792	-	-
Additions to unobligated balance	(969 391)	-	-
TOTAL	36 931 858[a/]	44 074 000	51 006 000
EXPENDITURES			
Regular Budget	30 285 527	37 002 000	43 501 000
Operating Fund I	1 063 018	1 222 000	1 155 000
Operating Fund II	3 576 030	5 850 000	6 350 000
TOTAL	34 924 575	44 074 000	51 006 000

a/ The difference of $2 007 283 between expenditures and receipts represents the provisional cash surplus for 1975.

THE REGULAR BUDGET

Summary of income

Table 2

Item	1975 Actual	1976 Adjusted budget	Increase or (decrease) over 1976	1977 Estimate
Assessed contributions on Member States	26 309 822	34 237 000	2 763 000	37 000 000
Portion of 1974 assessments transferred to 1975 budget	800 000	-	-	-
Transfer of cash surplus	2 235 308[a/]	-	3 350 000	3 350 000[b/]
Miscellaneous income				
(a) Attributable to specific programmes				
Publications of the Agency	389 221	380 000	70 000	450 000
INIS publications including microfiches	103 511	255 000	(30 000)	225 000
CINDA publications	31 921	22 000	13 000	35 000
Advertising	14 898	10 000	7 000	17 000
Laboratory income	22 250	37 000	(17 000)	20 000
Sale of surplus property	11 011	8 000	22 000	30 000
IAEA/UNIDO joint services arrangement				
Computer services	275 455	300 000	25 000	325 000
Printing services	138 006	140 000	20 000	160 000
Other services	200 418	175 000	(55 000)	120 000
Amounts recoverable under safeguards agreements from non-member States	13 920	5 000	10 000	15 000
UNDP programme support cost	578 531	420 000	140 000	560 000
Reimbursable services for AGRIS	18 692	115 000	(65 000)	50 000
Reimbursable services for the International Development Research Centre	12 024	-	-	-
Sub-total	1 809 858	1 867 000	140 000	2 007 000
(b) Not attributable to specific programmes				
Investment and short-term deposits	482 250	315 000	105 000	420 000
Refund from the United Nations Joint Staff Pension Fund	114 593	230 000	(110 000)	120 000
Other	540 979	353 000	251 000	604 000
Sub-total	1 137 822	898 000	246 000	1 144 000
Total miscellaneous income	2 947 680	2 765 000	386 000	3 151 000
TOTAL	32 292 810	37 002 000	6 499 000	43 501 000

a/ Final 1973 cash surplus $635 308, portion of 1974 cash surplus $1 600 000.

b/ See Annex VII, paragraph 3 of draft resolution A.

THE OPERATIONAL BUDGET

Summary of income, allocations and expenditures

Table 3

Item	General Fund			Operating Fund I			Operating Fund II		
	1975 Actual	1976 Budget	1977 Estimate	1975 Actual	1976 Budget	1977 Estimate	1975 Actual	1976 Budget	1977 Estimate
INCOME									
Voluntary contributions of Member States	4 219 641	5 500 000	6 000 000	-	-	-	-	-	-
Special contributions of Member States:									
Italy	-	-	-	350 000	350 000	350 000	-	-	-
Monaco	-	-	-	76 190	70 000	87 000	-	-	-
Others	-	-	-	29 806	-	-	-	-	-
Direct contributions for special projects:									
UNESCO	-	-	-	232 000	240 000	302 000	-	-	-
UNDP	-	-	-	284 000	210 000	180 000	-	-	-
SIDA	-	-	-	111 639	308 000	200 000	-	-	-
Others	-	-	-	10 321	-	-	-	-	-
Income from investment and short-term deposits	118 733	150 000	100 000	-	-	-	-	-	-
Assessed programme costs	-	-	-	-	-	-	189 255	200 000	250 000
Miscellaneous income	-	-	-	37 301	44 000	36 000	17 792	-	-
Additions to unobligated balance	-	-	-	(80 851)	-	-	(969 391)	-	-
Savings in prior years' operations	-	-	-	12 612	-	-	-	-	-
	4 338 374	5 650 000	6 100 000	1 063 018	1 222 000	1 155 000	(762 344)	200 000	250 000
Transfers from General Fund to Operating Fund II	(4 338 374)	(5 650 000)	(6 100 000)	-	-	-	4 338 374	5 650 000	6 100 000
TOTAL	-	-	-	1 063 018	1 222 000	1 155 000	3 576 030	5 850 000	6 350 000
ALLOCATIONS AND EXPENDITURES									
Operating Fund I:									
Trieste Centre	-	-	-	965 438	1 143 000	1 045 000	-	-	-
Monaco Laboratory	-	-	-	97 580	79 000	110 000	-	-	-
Operating Fund II:									
Technical assistance									
Experts and equipment	-	-	-	-	-	-	2 412 021	4 000 000	4 300 000
Fellowships and training	-	-	-	-	-	-	1 164 009	1 850 000	2 050 000
TOTAL	-	-	-	1 063 018	1 222 000	1 155 000	3 576 030	5 850 000	6 350 000

EXTRABUDGETARY RESOURCES

Table 4

Source of funds	1975 Actual[a/]	1976 Estimate	1977 Estimate
UNDP	3 942 000	3 600 000	4 200 000
UNEP	91 000	563 000	483 000
FAO[b/]	374 000	500 000	680 000
SIDA[c/]	384 000	500 000	500 000
Joint co-ordinated research supported by the Government of the			
Federal Republic of Germany	309 000	315 000	315 000
United States of America	33 000	84 000	84 000
Special contributions in support of the study on regional nuclear fuel cycle centres	-	163 000	30 000
Special fellowships offered by the Government of the Soviet Union	-	125 000[d/]	10 000
TOTAL	5 133 000	5 850 000	6 302 000

a/ Rounded up to the nearest thousand dollars.

b/ The amount of $1 180 000 included in the FAO budget for the biennial period 1976-77 has been reduced to $894 860.

c/ Subject to confirmation.

d/ Represents cash in banks for fellowships.

SUMMARY OF ESTIMATED PROGRAMME RESOURCES 1977
(Excluding contributions in kind)[a/]

Table 5

Programme	Consolidated budget (Table 1)		Extrabudgetary resources (Table 4)		Total estimated resources
	Regular Budget	Operational Budget	United Nations organizations	Special contributions	
Policy-making organs	1 614 000				1 614 000
Executive management and technical programme planning	915 000				915 000
Technical assistance and training	1 867 000	6 350 000	4 200 000	510 000	12 927 000
Food and agriculture	2 512 000		680 000	365 000	3 557 000
Life sciences	1 944 000		140 000	34 000	2 118 000
Physical sciences	3 613 000				3 613 000
International Centre for Theoretical Physics	600 000	1 045 000			1 645 000
Nuclear power and reactors	2 988 000		8 000	30 000	3 026 000
Nuclear safety and environmental protection	3 326 000		245 000		3 571 000
International Laboratory of Marine Radioactivity	610 000	110 000	90 000		810 000
Information and technical services	2 905 000				2 905 000
Nuclear explosions for peaceful purposes	260 000				260 000
Safeguards	7 951 000				7 951 000
Administration	4 709 000				4 709 000
General services	4 177 000				4 177 000
Service activities	160 000				160 000
Permanent Headquarters	3 350 000				3 350 000
TOTAL	43 501 000	7 505 000	5 363 000	939 000	57 308 000

a/ In addition to the above indicated cash resources, cost free experts and consultants, contributions in kind, stipends for fellowships and training courses are provided by Member States.

THE PROGRAMME BUDGET

Price and programme changes, 1976-1977

By programme

Table 6

	1976 Adjusted budget[a]	Price increase		Programme increase		Transfer to Permanent Headquarters		Total change		1977 Estimate	1978 Preliminary estimate
	$	$	%	$	%	$	%	$	%	$	$
A Policy-making organs	1 262 000	136 800	10,8	215 200	17,1	-	-	352 000	27,9	1 614 000	1 606 000
B Executive management and technical programme planning	829 000	85 400	10,3	600	0,1	-	-	86 000	10,4	915 000	975 000
C Technical assistance and training (Regular Budget)	1 669 000	162 300	9,7	35 700	2,1	-	-	198 000	11,8	1 867 000	2 053 000
D. Food and agriculture	2 289 000	153 300	6,7	69 700	3,0	-	-	223 000	9,7	2 512 000	2 847 000
E Life sciences	1 686 000	144 200	8,6	113 800	6,7	-	-	258 000	15,3	1 944 000	2 253 000
F. Physical sciences	3 164 000	273 700	8,7	175 300	5,5	-	-	449 000	14,2	3 613 000	3 982 000
G The Laboratory	-	-	-	-	-	-	-	-	-	-	-
H International Centre for Theoretical Physics											
Regular Budget	305 000	45 000	14,8	250 000	81,9	-	-	295 000	96,7	600 000	600 000
Operating Fund I	1 143 000	72 800	6,4	(170 800)	(14,9)	-	-	(98 000)	(8,5)	1 045 000	1 065 000
Sub-total	1 448 000	117 800	8,1	79 200	5,5	-	-	197 000	13,6	1 645 000	1 665 000
I Nuclear power and reactors											
Regular programme	2 224 000	191 700	8,6	169 300	7,6	-	-	361 000	16,2	2 585 000	3 000 000
International conference on nuclear power and its fuel cycle	-	-	-	403 000	-	-	-	403 000	-	403 000	-
J. Nuclear safety and environmental protection	3 121 000	229 900	7,4	(24 900)	(0,8)	-	-	205 000	6,6	3 326 000	3 639 000
K International Laboratory of Marine Radioactivity											
Regular Budget	498 000	73 700	14,8	38 300	7,7	-	-	112 000	22,5	610 000	678 000
Operating Fund I	79 000	26 000	19,0	5 000	-	-	-	31 000	19,0	110 000	103 000
Sub-total	577 000	99 700	17,3	43 300	7,5	-	-	143 000	24,8	720 000	781 000
L Information and technical services	2 891 000	267 200	9,2	(253 200)	(8,7)	-	-	14 000	0,5	2 905 000	3 239 000
M Nuclear explosions for peaceful purposes	208 000	21 300	10,2	30 700	14,8	-	-	52 000	25,0	260 000	312 000
N Safeguards	6 443 000	576 000	8,9	932 000	14,5	-	-	1 508 000	23,4	7 951 000	9 111 000
O Administration	4 293 000	372 300	8,7	43 700	1,0	-	-	416 000	9,7	4 709 000	5 088 000
P General services	3 680 000	350 400	9,5	146 600	4,0	-	-	497 000	13,5	4 177 000	4 487 000
Q Service activities	140 000	13 000	9,3	7 000	5,0	-	-	20 000	14,3	160 000	170 000
R Adjustment of programme cost estimates	2 300 000	(2 300 000)	-	-	-	-	-	(2 300 000)	-	-	-
S Transfer of the Agency to its permanent headquarters	-	-	-	-	-	3 350 000	-	3 350 000	-	3 350 000	1 500 000
TOTAL Regular Budget and Operating Fund I	38 224 000	895 000	2,3	2 187 000	5,7	3 350 000	8,8	6 432 000	16,8	44 656 000	46 708 000
Source of funds											
Regular Budget											
Programme budget	34 702 000	3 096 200	8,9	2 352 800	6,8	3 350 000	9,6	8 799 000	25,3	43 501 000	45 540 000
Adjustment of programme cost estimates	2 300 000	(2 300 000)	-	-	-	-	-	(2 300 000)	-	-	-
Total Regular Budget	37 002 000	796 200	2,2	2 352 800	6,4	3 350 000	9,0	6 499 000	17,6	43 501 000	45 540 000
Operating Fund I	1 222 000	98 800	-	(165 800)	-	-	-	(67 000)	-	1 155 000	1 168 000
Operating Fund II[*]	5 850 000	[b]	-	[b]	-	-	-	500 000	-	6 350 000	6 350 000[d]
	44 074 000	895 000[c]	-	2 187 000[c]	-	3 350 000	-	6 932 000	15,7	51 006 000	53 058 000
Regular Budget	37 002 000	796 200	2,2	2 352 800	6,4	3 350 000	9,0	6 499 000	17,6	43 501 000	45 540 000
Less: Miscellaneous income	2 765 000	232 000	-	154 000	-	-	-	386 000	-	3 151 000	3 401 000
Transfer of cash surplus	-	-	-	-	-	3 350 000	-	3 350 000	-	3 350 000	1 500 000
Assessment on Member States	34 237 000	564 200	1,7	2 198 800	6,4	-	-	2 763 000	8,1	37 000 000	40 639 000

a/ Details of adjustments to the 1976 budget are given in para. 19. of the Introduction.

b/ Since the total change of $500 000 is largely due to the raising of the target for voluntary contributions to the General Fund, no distribution between price and programme increases for 1977 has been made.

c/ Excluding the pro-rating of the total change in respect of Operating Fund II from 1976 to 1977.

d/ This figure, which assumes the same target as for 1977, is included solely for the purpose of completing the column.

Price and programme changes, 1976-1977

By item of expenditure

Table 7

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976				1977 Estimate	1978 Preliminary estimate
			Price	Programme	Transfer to Permanent Headquarters	Total		
Salaries and wages								
Established posts	17 345 374	19 972 200	1 755 800	672 000	-	2 427 800	22 400 000	24 765 000
Consultants	317 575	442 900	17 600	188 800	-	206 400	649 300	740 600
Overtime	92 825	117 100	9 200	17 900	-	27 100	144 200	153 800
Temporary assistance	420 487	745 200	58 600	96 600	-	155 200	900 400	954 700
Sub-total	18 176 261	21 277 400	1 841 200	975 300	-	2 816 500	24 093 900	26 614 100
Common staff costs	5 170 607	5 813 900	706 800	211 100	-	917 900	6 731 800	7 444 300
Travel	675 589	867 600	39 800	84 400	-	124 200	991 800	1 222 300
Meetings								
Conferences, symposia, seminars	541 475	894 000	36 900	274 100	-	311 000	1 205 000	1 048 000
Technical committees, advisory groups	544 617	992 500	52 300	157 700	-	210 000	1 202 500	1 307 500
Representation and hospitality	68 119	87 500	6 000	4 000	-	10 000	97 500	101 200
Scientific and technical contracts	1 264 786	1 897 000	74 800	4 200	-	79 000	1 976 000	2 323 300
Scientific supplies and equipment	732 110	827 000	69 500	27 500	-	97 000	924 000	948 000
Common services, supplies and equipment	4 245 386	3 784 200	431 600	451 200	3 350 000	4 232 800	8 017 000	6 300 800
Other items of expenditure	362 727	375 900	18 500	(13 900)	-	4 600	380 500	368 500
Transfer of costs:								
Linguistic services[a/]	(367 725)	(803 000)	(72 900)	18 900	-	(54 000)	(857 000)	(880 000)
Printing and publishing services[a/]	(65 407)	(90 000)	(9 500)	(7 500)	-	(17 000)	(107 000)	(90 000)
Adjustment of programme cost estimates	-	2 300 000	(2 300 000)	-	-	(2 300 000)	-	-
TOTAL Regular Budget and Operating Fund I	31 348 545	38 224 000	895 000 2,3 %	2 187 000 5,7 %	3 350 000 8,8 %	6 432 000 16,8 %	44 656 000	46 708 000
Source of funds								
Regular Budget	30 285 527	37 002 000	796 200	2 352 800	3 350 000	6 499 000	43 501 000	45 540 000
Operating Fund I	1 063 018	1 222 000	98 800	(165 800)	-	(67 000)	1 155 000	1 168 000
Operating Fund II[*/]	3 576 030	5 850 000	b/	b/	-	500 000	6 350 000	6 350 000[c/]
TOTAL	34 924 575	44 074 000	895 000[d/]	2 187 000[d/]	3 350 000	6 932 000	51 006 000	53 058 000

a/ The decreases shown in the table for Linguistic services and for Printing and publishing services represent the costs which are attributable to the holding of meetings, since these costs have been transferred from the expenditure lines "Linguistic services" and "Printing and publishing services" of the "Service activities" programme to the expenditure lines "Conferences, symposia, seminars" and "Technical committees, advisory groups" of the programmes in which such services are used.

b/ Since the total change of $500 000 is largely due to the raising of the target for voluntary contributions to the General Fund, no distribution between price and programme increases for 1977 has been made.

c/ This figure, which assumes the same target as for 1977, is included solely for the purpose of completing the column.

d/ Excluding the pro-rating of the total change in respect of Operating Fund II from 1976 to 1977.

Summary of manpower by grade of post

Table 8

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
DG	1	1	1	-	1	1
DDG/IG	5	5	5	-	5	5
D	19	20	20	1	21	21
P-5	100	109	109	7	116	120
P-4	146	153	153	12	165	174
P-3	113	112	112	4	116	124
P-2	47	41	41	2	43	42
P-1	24	22	22	(8)	14	11
Sub-total	455	463	463	18	481	498
GS	580	614	614	34	648	661
M&O	170	155	155	13	168	171
TOTAL	1 205	1 232	1 232	65	1 297	1 330

Summary of manpower by Department

Table 9

Department	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
Office of the Director General	8	8	6	6	12	12
Department of Administration	434	434	436	16	452	456
Department of Research and Isotopes	240	248	248	5	253	259
Department of Safeguards and Inspection	136	138	138	23	161	179
Department of Technical Assistance and Publications	191	193	193	3	196	198
Department of Technical Operations	196	211	211	12	223	226
TOTAL	1 205	1 232	1 232	65	1 297	1 330

A. POLICY-MAKING ORGANS

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table A. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	104 205	104 000	6 000	44 000	50 000	154 000	162 000
Overtime	8 932	4 200	300	100	400	4 600	5 000
Temporary assistance	11 911	11 300	600	(3 100)	(2 500)	8 800	8 800
Sub-total	125 048	119 500	6 900	41 000	47 900	167 400	175 800
Common staff costs	30 855	29 900	2 900	13 200	16 100	46 000	49 500
Travel	-	600	-	-	-	600	700
Common services, supplies and equipment	81 091	71 000	20 000	14 000	34 000	105 000	112 000
Other items of expenditure	10 550	13 000	3 000	-	3 000	16 000	17 000
Transfer of costs:							
Linguistic services	739 625	870 000	94 000	127 000	221 000	1 091 000	1 077 000
Printing and publishing services	121 103	158 000	10 000	20 000	30 000	188 000	174 000
TOTAL	1 108 272	1 262 000	136 800 10.8%	215 200 17,1%	352 000 27,9%	1 614 000	1 606 000

SUMMARY OF MANPOWER

Table A. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	-	-	1	-	1	1
P-4	2	2	2	-	2	2
Sub-total	2	2	3	-	3	3
GS	3	3	3	-	3	3
TOTAL	5	5	6	-	6	6

Distribution of costs between the General Conference and the Board

Table A. 3

Organization unit	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
General Conference	506 009	584 000	62 800	36 200	99 000	683 000	729 000
Board of Governors	602 263	678 000	74 000	179 000	253 000	931 000	877 000
TOTAL	1 108 272	1 262 000	136 800	215 200	352 000	1 614 000	1 606 000

CHANGES IN COSTS AND MANPOWER

Costs

A.1. As will be seen from Table A.1 above, the total cost of this programme is expected to increase by $352 000 as a result of price increases of $136 800 and a programme increase of $215 200. The latter is attributable to several factors. As a result of an organizational restructuring and the establishment of the Secretariat of the Policy-making Organs independent of the Division of Languages, a Director's post was required for the Secretary of the Policy-making Organs. The post was made available by transfer from the Director General's office in the adjusted manning table for 1976. A programme increase of $57 200 in respect of salaries and related common staff costs reflects the financial impact for the programme.

A.2. The increase of $14 000 in respect of common services and supplies is partly attributable to additional meetings of the Committees of the Board, and partly to the provision for the "Scientific afternoon" during the General Conference. No funds for these activities had been included in previous budget estimates. The programme increase of $20 000 in respect of printing and publishing services is mainly attributable to the publication which will be issued in commemoration of the Agency's twentieth anniversary. The translation of this publication into the working languages will require some additional linguistic services. The main part of the programme increase of $127 000 in respect of linguistic services is due to an expected increase in the number of Committee meetings of the Board for which additional interpretation, translation and records services will be required. A small reduction is foreseen in the requirements for temporary assistance during the meetings of the Board.

Manpower

A.3. As will be seen from Table A.2 above, a Director's post was transferred to this programme from "Executive management and technical programme planning" in the 1976 adjusted manning table for the Secretary of the Policy-making Organs. No further change in the manning table is foreseen for 1978.

THE PROGRAMME

A.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 four units in the Secretariat. The Secretariat of the Policy-making Organs undertakes the organizational and administrative work involved. The Division of Languages provides the language services (translation of documents and interpretation at meetings) and prepares records of proceedings. Documents are reproduced and circulated by the Division of Publications, and the Division of External Relations is responsible for providing the facilities 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 will report to the Director General. Certain matters related to internal administration will be co-ordinated with the Head of the Department of Administration.

A.5. It is planned to provide these services throughout the period 1977-1982 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.

B. EXECUTIVE MANAGEMENT AND TECHNICAL PROGRAMME PLANNING

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table B.1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	472 541	524 000	56 000	(51 000)	5 000	529 000	556 000
Consultants	48 202	17 400	1 400	50 800	52 200	69 600	74 600
Overtime	6 368	4 900	300	3 400	3 700	8 600	9 200
Temporary assistance	2 537	-	-	-	-	-	-
Sub-total	529 648	546 300	57 700	3 200	60 900	607 200	639 800
Common staff costs	141 494	153 200	20 300	(14 700)	5 600	158 800	167 600
Travel	43 806	44 500	2 200	7 800	10 000	54 500	63 600
Meetings							
Technical committees, advisory groups	23 293	38 000	3 000	4 000	7 000	45 000	50 000
Representation and hospitality	21 991	23 000	200	300	500	23 500	24 000
Transfer of costs:							
Linguistic services	20 331	20 000	2 000	(3 000)	(1 000)	19 000	22 000
Printing and publishing services	2 160	4 000	-	3 000	3 000	7 000	8 000
TOTAL	782 723	829 000	85 400 10.3%	600 0,1%	86 000 10,4%	915 000	975 000

SUMMARY OF MANPOWER

Table B.2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
DG	1	1	1	-	1	1
DDG	3	3	3	-	3	3
D	2	2	1	-	1	1
P-5	1	1	1	-	1	1
P-3	1	1	2	1	3	3
P-2	3	3	2	-	2	2
P-1	2	2	2	(1)	1	1
Sub-total	13	13	12	-	12	12
GS	9	9	8	-	8	8
TOTAL	22	22	20	-	20	20

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 increase by $86 000, of which $85 400 will be required to cover salary and other price increases and $600 represents a programme increase. A programme reduction of $65 700, which is mainly attributable to the transfer of a Director's post from the Office of the Director General to the Secretariat of the Policy-making Organs, is partly offset by a provision of $50 800 for additional consultants' services and an increase of $3400 in respect of overtime. Travel funds of $7800 will be required by the Office of the Director General and the Offices of the Deputy Directors General for Technical Operations and for Technical Assistance and Publications. The programme increase of $4300 in respect of meetings and hospitality is related to the meetings of SAC. Additional requirements in respect of printing and publishing services are offset by reductions in respect of linguistic services.

Manpower

B. 2. As will be seen from Table B. 2 above, the staffing requirements for this programme for 1977 can be met by the upgrading of a vacant P-1 post to the P-3 level in the Office of the Director General. As the result of a redeployment of posts and internal transfers there is a net reduction of one Director's post and one GS post for this programme in the 1976 adjusted manning table. No further change in the manning table is foreseen for 1978.

THE PROGRAMME

OBJECTIVE

B. 3. 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 co-ordination of the Agency's work.

B. 4. 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.

C. TECHNICAL ASSISTANCE AND TRAINING

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table C. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	956 364	1 056 700	98 300	57 000	155 300	1 212 000	1 330 000
Consultants	9 741	34 000	1 000	-	1 000	35 000	40 000
Overtime	398	1 500	100	(400)	(300)	1 200	1 500
Temporary assistance	19 919	6 500	400	(400)	-	6 500	7 000
Sub-total	986 422	1 098 700	99 800	56 200	156 000	1 254 700	1 378 500
Common staff costs	285 794	307 100	40 000	17 000	57 000	364 100	399 300
Travel	31 230	59 000	2 500	(6 500)	(4 000)	55 000	60 000
Representation and hospitality	1 001	1 200	-	-	-	1 200	1 200
Transfer of costs:							
Linguistic services	129 412	159 000	17 000	(28 000)	(11 000)	148 000	162 000
Printing and publishing services	37 097	42 000	3 000	(7 000)	(4 000)	38 000	44 000
Data processing services	14 019	2 000	-	4 000	4 000	6 000	8 000
Other	3 576 030	5 850 000	-a/	-a/	500 000	6 350 000	6 350 000c/
TOTAL	5 061 005	7 519 000	162 300b/	35 700b/	698 000 9,3%	8 217 000	8 403 000
Source of funds							
Regular Budget	1 484 975	1 669 000	162 300	35 700	198 000	1 867 000	2 053 000
Operating Fund II	3 576 030	5 850 000	-a/	-a/	500 000	6 350 000	6 350 000c/
TOTAL	5 061 005	7 519 000	162 300b/	35 700b/	698 000 9,3%	8 217 000	8 403 000

a/ Since the total change of $500 000 is largely due to the raising of the target for voluntary contributions to the General Fund no distribution between price and programme increases for 1977 has been made.

b/ Excluding the pro-rating of the total change in respect of Operating Fund II from 1976 to 1977.

c/ This figure, which assumes the same target as for 1977, is included solely for the purpose of completing the column.

SUMMARY OF MANPOWER

Table C. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	7	7	7	-	7	8
P-4	9	10	11	-	11	11
P-3	3	3	2	1	3	3
P-2	1	2	3	-	3	3
Sub-total	21	23	24	1	25	26
GS	35	35	35	1	36	37
TOTAL	56	58	59	2	61	63

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 under the Regular Budget will increase by $198 000 as a result of price increases of $162 300 and a programme increase of $35 700.

C. 2. An amount of $74 000 in respect of salaries and related common staff costs will be required for the additional staff needed under this programme - one P-3 post and one GS post in 1977, and a P-2 post which it was possible to make available to this programme in the 1976 adjusted manning table by transfer from another programme.

C. 3. Based on actual requirements in 1975, a programme reduction of $6500 in respect of travel is considered possible. Further programme reductions are foreseen in respect of linguistic and printing and publishing services in the amount of $35 000, while an increase of $4000 is required for data processing services.

C. 4. The increase of $500 000 in the Operational Budget is attributable to an increase in the target for voluntary contributions from $5. 5 million for 1976 to $6 million for 1977.

C. 5. It is expected that UNDP will place an amount of $4 200 000 at the Agency's disposal for 1977, and it is also hoped that an amount of $500 000 will be available from SIDA for technical assistance in 1977.

Manpower

C. 6. As will be seen from Table C. 2 above, the addition of one Professional post and one GS post is foreseen for 1977.

C. 7. In view of the rapid increase in the number of procurement orders, which during the last four years have more than doubled, while the Professional staff remained at the same level, an additional procurement officer at the P-3 level is urgently required in the Equipment Section. In addition to the increase in volume, the higher complexity of projects requires more technical correspondence with suppliers and an increased search for and evaluation of technical data in catalogues. One GS post is required in 1977 for clerical support.

C. 8. Technical assistance programmes, particularly under UNDP, are expanding in Africa, and it is anticipated that in the Europe and Middle East region there will be additional programmes at the national and regional levels. At present, Senior Area Officers in the two Sections in question have to concern themselves with details of projects which should be carried out by junior officers. In order to enable Senior Area Officers to meet the needs of developing countries by assisting in programme and project formulation and to provide those Officers with essential information on economic conditions and other relevant factors, an additional P-2 post to serve both Sections was made available by a redeployment of existing posts and transfer from another programme.

C. 9. For 1978 one additional P-5 post will be required for programme co-ordination, and one additional GS post for the Latin America Section.

THE PROGRAMME

OBJECTIVE

C. 10. The objective is to promote the transfer of skills and knowledge relating to the use of nuclear energy for peaceful purposes, to support efforts to carry out nuclear energy activities more effectively and to ensure that the skills and knowledge transferred can continue to be applied after the provision of such assistance by the Agency has been completed.

STRUCTURE

C.11. This programme consists of two sub-programmes, which are dealt with separately below.

SUB-PROGRAMMES

Experts and equipment

OBJECTIVE

C.12. The objective is to provide expert assistance, specialized equipment and nuclear material for development projects in Member States.

RESULTS TO DATE

C.13. The Agency started to provide technical assistance in 1958. Up to the end of 1975, it had made available the services of about 2600 experts and visiting professors in 82 countries and provided equipment and supplies valued at $18.4 million. Of this total, the Agency's own resources and gifts-in-kind from Member States accounted for the provision of 1500 experts and $9 million worth of equipment, the remainder being financed by UNDP.

PLANS FOR 1977-78

C.14. The annual programme of assistance is drawn up on the basis of requests made by Member States and reflects priorities which their Governments themselves establish. The Agency's programme therefore represents the sum of requests for the provision of assistance for which resources are available and is established in complete agreement with recipient Governments.

C.15. Owing to the current fuel situation, developing Member States are making intensified mineral resource surveys, including the search for uranium. This is reflected in the Agency's technical assistance programme by the fact that about 15% of the programme in recent years has been devoted to all aspects of uranium development, and it is expected that in 1977-78 the Agency will be providing UNDP-financed large-scale assistance to uranium prospection projects in 5-8 countries. The programme is expected to reflect the fact that as the lead time for the introduction of nuclear power is of the order of ten years, Member States are taking first steps in feasibility studies, including economic evaluations, and in the next phase, siting and training of required manpower. Since nuclear technology changes rapidly, its applications tend to expand, and particularly the more developed of the developing countries are embarking on projects involving non-destructive testing, use of high and low radiation sources for radiosterilization of pharmaceuticals, activation analysis and other processes utilized in industrial development. The lesser developed countries with low levels of per capita income direct a large share of their internal resources to programmes in agriculture and education and it is expected that Governments will continue to stress their need for assistance in these fields.

C.16. The supply of nuclear material in small amounts is an activity which has been transferred from Nuclear Power and Reactors to Technical Assistance. While the majority of developing countries is dependent on industrialized countries for the supply of nuclear materials, in particular enriched uranium and heavy water, one of the Agency's functions is to assist developing countries in obtaining such materials in assured quantities. The work will be carried out jointly with the Legal Division.

C.17. To ensure that the most effective use is made of the limited resources available for the provision of multilateral aid, increasing emphasis will be placed on longer term programming and project formulation. This will be done by staff members who will, if necessary, work in conjunction with specialists and consultants.

C. 18. In the light of the recommendation in the Final Declaration of the Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, the attention of the States party to the Treaty will continue to be drawn to "technically sound" requests for technical assistance submitted to the Agency by developing States party to the Treaty which the Agency is unable to finance from its own resources, as well as such "technically sound" requests as may be made by developing States party to the Treaty which are Members of the Agency.

PLANS FOR 1979-82

C. 19. Government programmes are expected to continue to move in the directions mentioned above and this will be reflected in the Agency's technical assistance programme.

CO-OPERATION WITH OTHER ORGANIZATIONS

C. 20. The Agency is executing about 20 large-scale UNDP projects, three of them in association with UNIDO, UNESCO and the United Nations. It will also continue to act as a sub-contractor in some projects for which other United Nations organizations are executing agencies. Links have been established with other organizations which operate bilateral assistance programmes, such as SIDA and the Danish International Development Agency. The Agency will continue this co-operation at the regional, interregional and national levels in projects financed by SIDA.

Fellowships and training

OBJECTIVE

C. 21. The objective is to assist Member States in building up their scientific and technical infrastructure with a view to promoting economic and scientific development through the application of nuclear technology.

RESULTS TO DATE

C. 22. Between 1958, when this sub-programme started, and 1975 over 5500 fellowships were awarded for individual training. In addition, approximately 2800 engineers, scientists, technicians and government officials received training in over 180 regional and interregional training projects organized by the Agency.

C. 23. The number of fellowships directly related to nuclear power engineering and planning more than doubled from 1974 to 1975, and has increased even further this year.

C. 24. In 1975, the Agency's first course in Nuclear Power Project Planning and Implementation (Phase I) was held at Karlsruhe, Federal Republic of Germany, from 7 September to 18 December. Thirty-six participants from 22 countries attended this course, which was designed to provide information and to transfer experience on the various aspects of planning for the first nuclear power station to be built in a participant's country. Funds for the course were provided jointly by the Agency and the Federal Republic of Germany. Three identical courses are being conducted this year under similar terms, one at Argonne, United States of America, one at Saclay, France, and another at Karlsruhe. In addition, a follow-up course on Nuclear Power Project Construction and Operation (Phase II) is being given at Argonne in September 1976.

C. 25. A Workshop on the Training of Laboratory Technicians in Asia was held in the Republic of Korea in 1975.

PLANS FOR 1977-78

C. 26. Each year the Agency expects to award from 350 to 400 fellowships under its regular programme.

C. 27. The Agency normally provides from 10 to 18 training courses each year at which 200 to 300 persons receive intensive training in various technical subjects over short periods. In response to the needs of Member States, priority is being given by the Agency to training in technologies related to nuclear power, the training of various kinds of technicians required to support programmes in nuclear power, and the use of radioisotopes in agriculture, medicine and industry.

C. 28. As more fellowships are being awarded in the field of nuclear power, there is a growing demand from Member States for training of a practical nature, on-the-job training, and training by arranging for the trainee to take part in engineering activities related to design, construction, operation and testing of nuclear power components and nuclear power stations. There is a strongly-felt need for the Agency to provide this kind of practical experience for a number of its fellows. This has been recognized by the Agency in the nuclear power courses, which emphasize the transfer of experience. The need for trained scientists is not so great now in many developing countries as the need for trained engineers, technicians and technical managers when a country is embarking upon a nuclear power programme. This situation will be increasingly reflected in the Agency's training programme.

C. 29. It is expected that Phase I and Phase II of the Nuclear Power Training Course will be repeated in 1977 and thereafter for as long as there is a demand. The Agency has estimated that about 400 participants should be trained in Phase I and 400 in Phase II between 1975 and 1978.

C. 30. The Agency is also giving higher priority to the training of technicians in various fields related to nuclear power and the application of radioisotopes to medicine, agriculture and industry. The number of fellowships devoted to the training of technicians nearly doubled from 1973 to 1975, and will undoubtedly increase further this year and in 1977. The Training Course in the Repair, Maintenance and Use of Nuclear Electronic Instruments, previously held annually in Turin, Italy, will probably be given two or three times a year starting in 1977.

C. 31. It is expected that an increasing proportion of the resources will be devoted to the provision of equipment and there will therefore be a concomitant need for manpower trained in its repair and maintenance. Emphasis will be placed on training at the national level and on training of instructors for various courses which will be carried out on an interregional basis. In addition, an expansion of the programme leading to the introduction of nuclear power may require training in safeguards as well as in disciplines associated with all facets of the power programme.

PLANS FOR 1979-82

C. 32. By 1979, the series of nuclear power project planning and implementation courses will have completed a four-year schedule and it is expected that while assistance will continue to be given in one form or another in these areas, emphasis may shift to the applications of nuclear technological processes to the economic development of the recipient States.

CO-OPERATION WITH OTHER ORGANIZATIONS

C. 33. Co-operation with UNESCO, ILO, WHO and other United Nations agencies concerned with training, particularly at the technician level, will continue. SIDA support for fellowship and training course activities will be maintained.

D. FOOD AND AGRICULTURE

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table D. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	436 256	478 500	41 500	14 000	55 500	534 000	614 000
Consultants	16 612	25 000	1 000	(4 000)	(3 000)	22 000	35 000
Overtime	161	500	-	-	-	500	600
Temporary assistance	2 565	1 800	200	-	200	2 000	2 200
Sub-total	455 594	505 800	42 700	10 000	52 700	558 500	651 800
Common staff costs	130 628	139 300	17 000	4 200	21 200	160 500	184 000
Travel	19 448	33 000	1 500	(8 000)	(6 500)	26 500	40 000
Meetings							
Conferences, symposia, seminars	2 756	46 000	2 500	12 500	15 000	61 000	65 000
Technical committees, advisory groups	27 180	60 000	3 000	2 000	5 000	65 000	78 000
Representation and hospitality	1 052	3 500	400	-	400	3 900	4 500
Scientific and technical contracts	375 588	320 000	16 000	16 000	32 000	352 000	420 000
Common services, supplies and equipment	90	400	200	-	200	600	700
Transfer of costs:							
Linguistic services	74 913	88 000	9 000	(10 000)	(1 000)	87 000	105 000
Printing and publishing services	185 381	221 000	16 000	(13 000)	3 000	224 000	273 000
Data processing services	6 197	19 000	2 000	(6 000)	(4 000)	15 000	30 000
Laboratory services	672 000	853 000	43 000	62 000	105 000	958 000	995 000
TOTAL	1 950 827	2 289 000	153 300 6,7%	69 700 3,0%	223 000 9,7%	2 512 000	2 847 000

SUMMARY OF MANPOWER

Table D. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	- (1)[a/]	- (1)	- (1)	-	- (1)	- (1)
P-5	6 (2)	6 (2)	7 (2)	-	7 (2)	7 (2)
P-4	6 (3)	6 (4)	5 (4)	1	6 (4)	7 (5)
P-3	1 (-)	1 (1)	1 (-)	-	1 (-)	1 (1)
Sub-total	13 (6)	13 (8)	13 (7)	1	14 (7)	15 (9)
GS	8 (6)	8 (7)	8 (7)	-	8 (7)	9 (8)
TOTAL	21 (12)	21 (15)	21 (14)	1	22 (14)	24 (17)

a/ FAO staff in brackets.

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

Table D. 3

	1974-75 Approved budget	Estimates 1976-77
Salaries and common staff costs for Professional staff	454 010	641 800
Consultants	38 100	70 800
Duty travel	19 660	38 400
Contractual services and equipment	164 300	377 700
Meetings	a/	a/
Publications	32 900	51 300
TOTAL	708 970	1 180 000 b/

a/ The cost amounting to $122 900 in 1976-77 and $83 100 in 1974-75 is included under Salaries and common staff costs and Contractual services on the basis of CCAQ's expenditure classification.

b/ Was reduced by FAO to $894 860.

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 $223 000 in 1977, of which $153 300 will be required to cover salary and other price increases and $69 700 will be a programme increase.

D.2. The programme increase of $18 200 in respect of salaries for established posts and common staff costs is the net result of the addition of a P-4 post in the "Chemical residues and pollution" sub-programme on the one hand and delays in recruitment on the other. A programme decrease of $4000 is foreseen for consultants' services.

D.3. The increase of $12 500 in respect of conferences, symposia and seminars is required for an additional meeting for 1977, that is an increase from two meetings in the 1976 budget to three in the estimates for 1977. The increase of $16 000 in respect of scientific and technical contracts is related to several sub-programmes.

D.4. As regards the transfers of costs, it is expected that there will be programme reductions in respect of linguistic services ($10 000), printing and publishing services ($13 000) and data processing services ($6000), and a programme increase in respect of laboratory services ($62 000). The latter is due mainly to the apportionment of the construction cost of an annex to the laboratory in 1977.

D.5. FAO had included an amount of $1 180 000 in the budget for 1976-77 in respect of its contribution for the two-year period towards the financing of the Joint FAO/IAEA Division's activities but subsequently reduced this amount to $894 860 for the two-year period, as shown in Table D.3 above.

D.6. The support of the Federal Republic of Germany for activities relating to nitrogen residues and protein development will continue in 1977: contributions to the Joint Fertilizer Project in an amount of about $139 000, to the Joint Protein Programme in an amount of about $166 000 and to the tsetse fly project in an amount of $10 000 are expected for that year. It is also expected that the United States of America will support joint co-ordinated research by a contribution of $50 000 in 1977.

Manpower

D.7. As will be seen from Table D.2 above, the addition of one P-4 post for the "Chemical residues and pollution" sub-programme is foreseen. This post will be required for an agricultural chemist or biochemist who will be mainly dealing with the application of isotopes in the study of the conservation and interaction of soil organic residues. The work will involve initiation and supervision of co-ordinated research programmes relating to conservation of valuable plant nutrients from organic residues as well as the removal of undesirable contaminants in soil and ground water. This sub-programme has so far been supported by Professional staff from FAO only.

D.8. In 1978 one additional P-4 post will be required for the "Animal production and health" sub-programme. In addition, it is anticipated that FAO will contribute one additional P-4 post in 1978 for activities in the "Plant breeding and genetics" sub-programme. It is expected that each organization will provide the necessary secretarial support by adding one GS post each in 1978.

THE PROGRAMME

OBJECTIVE

D.9. The broad objective is to foster applications of isotopes and radiation in food and agriculture within a joint programme of FAO and the Agency. World production of food is not increasing at a rate commensurate with population growth, and the incidence of drought, crop failures and other natural disasters has resulted in a diminution of food stocks to an alarmingly low level. The situation has been aggravated in the past few years by cost increases and the scarcity of most agricultural commodities. The programme aims at employing nuclear techniques when necessary in combination with other advanced methods, to increase agricultural production, to improve food quality and to protect crops, livestock and food from pests, disease and spoilage in the most economic way. Special attention will be paid to the protection and conservation of the environment.

STRUCTURE

D.10. This programme consists of six sub-programmes, which are dealt with separately below. It should be noted that the advisory groups mentioned in the text are referred to as expert panels in the programme of FAO.

Summary of manpower and costs by sub-programme

Table D.4

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years		Costs	Man-years		Costs
	P	GS		P	GS	
Soil fertility, irrigation and crop production	3,2 (0,2)[a/]	1,7 (1,2)	573 000	3,2 (0,2)	1,6 (1,2)	638 000
Plant breeding and genetics	2,2 (2,2)	1,6 (1,2)	445 000	2,2 (2,2)	1,6 (1,2)	536 000
Animal production and health	1,2 (1,1)	0,7 (1,1)	202 000	2,2 (2,1)	1,6 (1,6)	292 000
Insect and pest control	2,1 (1,2)	1,3 (1,2)	784 000	2,1 (2,2)	1,6 (1,6)	808 000
Chemical residues and pollution	1,2 (2,1)	2,3 (0,2)	163 000	1,2 (2,1)	2,3 (0,2)	217 000
Food preservation	4,1 (0,2)	0,4 (2,1)	345 000	4,1 (0,2)	0,3 (2,2)	356 000
TOTAL	14,0 (7,0)	8,0 (7,0)	2 512 000	15,0 (9,0)	9,0 (8,0)	2 847 000

a/ FAO staff in brackets.

SUB-PROGRAMMES

Soil fertility, irrigation and crop production

OBJECTIVE

D.11. 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 nutrition and irrigation and other soil and water management practices, with a view to improving the quality of crops and increasing crop production in the most economic way.

PLANS FOR 1977-82

D.12. Research projects pertaining to the efficiency of fertilizer and water utilization by agricultural crops will continue. The current projects on grain legume fertilization, micronutrient deficiencies in flooded soils used for growing rice and soil moisture regimes will be phased out during 1977-78. The current programme on the fate of nitrogen fertilizer residues will continue until 1980.

D.13. New programmes will be developed in the light of the continuing interest in increasing the production of grain proteins and economizing on costly nitrogen and phosphate fertilizers. Attention will also be focused on the need for more effective utilization of the limited water resources and land available for crop production. In 1977, a project relating to the development of efficient water management practices for dry farming in semi-arid areas will be initiated. The recent disasters resulting from prolonged droughts (for example, in the Sahelean region) have spotlighted the urgent need for such a project.

D.14. A programme for the study of microbiological processes which can play an important role in providing nutrient elements for crop production will be developed. As a follow-up to an earlier project concerned with the root activity of tree crops, a programme for evaluating the efficiency of fertilizer management practices in the case of specific tree crops will be initiated in 1978. In 1979, a project concerned with the development of measures for diagnosing and correcting micronutrient deficiencies in grain legumes will be initiated; particular emphasis will be placed on obtaining higher yields and on reducing the dependence of grain legumes on fertilizer nitrogen by increasing their capacity to fix atmospheric nitrogen. A programme will also be initiated for developing efficient fertilizer and water management practices under the different cropping systems (multiple cropping, crop rotation, intercropping) which are being increasingly used as a means of achieving more intensive land utilization for higher crop production. More intensive land utilization will also be the aim of a project for improving management practices on salt-affected soils. A project concerned with the selection of irrigation systems which will ensure the efficient use of desalinated water is envisaged.

D.15. A review of recent developments in the use of nuclear methods in research into soil-water-plant relationships is planned for 1978 (Symposium - Annex III (2)).

D.16. At present, there are over 20 technical assistance projects associated with this sub-programme.

STRUCTURE

D.17. This sub-programme consists of three components, which are described in the following paragraphs.

Soil fertility, irrigation and crop production

Summary by programme components

Table D. 5

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
The use of isotopes and radiation in studies on plant nutrition and fertilizer application	1,2 (0,1)[a]	0,6 (0,4)	55 200	17 000	50 000	2 300	124 500
The use of isotopes and radiation in studies of soil-water regimes	1,0 (-)	0,5 (0,4)	44 900	-	20 000	2 200	67 100
The use of isotopes and radiation in studies of ion and water movement in soils	1,0 (0,1)	0,6 (0,4)	44 800	-	5 000	1 600	51 400
Linguistic, printing and publishing services	- -	- -	-	-	-	62 000	62 000
Data processing services	- -	- -	-	-	-	7 000	7 000
Laboratory services	- -	- -	-	-	-	261 000	261 000
TOTAL	3,2 (0,2)	1,7 (1,2)	144 900	17 000	75 000	336 100	573 000

a/ FAO staff in brackets.

The use of isotopes and radiation in studies on plant nutrition and fertilizer application

Objective

D. 18. The objective is to determine which methods of applying fertilizers to grain legumes are most efficient from the point of view of maximizing production without losing the economic benefits associated with the plants' capacity to fix atmospheric nitrogen (1973-77) and to develop methods of diagnosing and correcting micronutrient (mainly zinc) deficiencies in flooded soils used for growing rice (1974-78).

Results to date

D. 19. In the grain legume project (Table D. 11, No. 1), superphosphate fertilization has been found to increase yields, nodulation and atmospheric nitrogen fixation. Methods have been established for the efficient placement of phosphate fertilizers. Using ^{15}N-labelled urea, a method has been developed for obtaining an integrated measure of the total amount of atmospheric nitrogen fixed by a grain legume crop during its growing period. The application of fertilizer nitrogen as urea sometimes resulted in grain yield increments of 10-30%. Only 25-35% of the total nitrogen taken up by the crop (200-250 kg/hectare) was derived through the symbiotic fixation of atmospheric nitrogen. The application of nitrogen at the time of planting resulted in considerably less efficient utilization (30%) than application near the flowering stage (60-80%). Current project activities are directed to the evaluation of the effects of crop management practices such as irrigation, straw mulching, sulphur application and the split application of high doses of fertilizer nitrogen on the fixation of atmospheric nitrogen, fertilizer nitrogen utilization and grain yields.

D. 20. In the project on zinc deficiency in soils used for growing rice (Table D. 11, No. 2), current work is directed towards determining the zinc status of different rice-growing regions in the participating countries, devising soil tests for determining the micronutrient status of flooded soils, evaluating the efficiency of different methods of zinc application to flooded rice-growing soils and of the application of zinc in different compounds and surveying analytical procedures for the standardization of techniques to ensure the comparability of results.

Plans for 1977-78

D. 21. The grain legume project will be phased out in 1977 and the results obtained published as a Technical Report in 1978. A project concerning the efficiency of various fertilizer management practices in the case of specific tree crops will be initiated in 1977 (Advisory Group - Annex II (2)). A project concerning physiological aspects of plant yield and the role of microbiological processes in supplying plants with nutrients (particularly nitrogen), both symbiotically and non-symbiotically, will be initiated in 1978 (Advisory Group). The zinc deficiency project will be directed towards the development of effective remedial measures with a view to achieving higher yields.

D. 22. Ten to twelve research institutes in Member States will participate in each project under research contracts and agreements.

Related activities

D. 23. Subject to the availability of funds, a regional training course on the use of isotopes and radiation in the study of soil-plant relationships is planned to be held in the Middle East in 1977. The Agency's Laboratory will carry out supporting research and provide training for this component.

Plans for 1979-82

D. 24. The projects to be initiated in 1977 and 1978 will continue. A project concerning the development of diagnostic methods and remedial measures for micronutrient deficiencies in grain legumes, with particular emphasis on improving their nitrogen-fixing capacity and grain yields, will be initiated in 1979. In 1982, a project concerning the development of efficient fertilizer and water management practices for different cropping systems may be initiated.

Co-operation with other organizations

D. 25. This programme component involves co-operation with UNDP, SIDA, IRRI, ESNA and the International Soil Science Society.

The use of isotopes and radiation in studies of soil-water regimes

Objective

D. 26. The objective is to develop improved methods for the control of the dynamics of soil water in the field as a basis for the efficient use of soil and water resources (1972-77).

Results to date

D. 27. Soil moisture changes in soil profiles have been followed with neutron moisture meters and hydraulic conductivity determined as a function of soil moisture content for different soil types when the soil was fallow or being cropped under different water regimes. A reliable estimate of the drainage component has been made and water balances have been established. The results obtained have served as a basis for the development of techniques and cultivation practices aimed at increasing yields, reducing water losses and avoiding salt accumulation near the soil surface. Current activities are aimed both at developing new methods and at testing and improving the techniques developed for determing the drainage component.

Plans for 1977-78

D. 28. The project on the dynamics of soil water (Table D.11, No. 3) will be phased out in 1977 and the results published as a Technical Report in 1978. A five-year project concerning the development of efficient practices of water management under dry-farming conditions in semi-arid areas will be initiated. Over ten institutes in Member States will participate, with research co-ordination as appropriate.

Related activities

D. 29. The regional training course in 1977 referred to under the programme component entitled "The use of isotopes and radiation in studies of plant nutrition and fertilizer application" is also relevant here.

Plans for 1979-82

D. 30. The project concerning water management under dry-farming conditions will continue. A research project aimed at obtaining the highest return in monetary terms per unit of high-quality water from desalination plants will be initiated at suitable arid coastal sites during the period 1980-82.

Co-operation with other organizations

D. 31. This programme component involves co-operation with UNDP, IITA, ICRISAT, and EAAFRO.

The use of isotopes and radiation in studies of ion and water movement in soils

Objective

D. 32. The objective is to develop water and soil management practices which will maximize the utilization of fertilizer nitrogen residues by crops (1975-80).

Results to date

D. 33. Experiments in progress are directed towards the development and testing of techniques which will make it possible to account for fertilizer nitrogen over a period of years. This requires the measurement of both the soil and the fertilizer nitrogen taken up by a crop, the residual fertilizer nitrogen (both inorganic and organic) within the rooting zone, losses of gaseous nitrogen to the atmosphere and losses of nitrogen through leaching below the rooting zone. No results are available yet for comment.

Plans for 1977-78

D. 34. The project on fertilizer nitrogen residues (Table D.11, No. 4) will continue, in conjunction with the "Chemical residues and pollution" sub-programme, emphasis being placed on the establishment of nitrogen balances for different soil and crop management practices (the use of different water regimes and cropping sequences, the incorporation of organic and inorganic materials for soil amelioration, variation of the timing and rates of fertilizer nitrogen additions, etc.). Approximately 13 research institutes in Member States will participate, with co-ordination meetings as appropriate. The project is supported by the Government of the Federal Republic of Germany.

Related activities

D. 35. The Agency's Laboratory will carry out supporting research and provide training.

Plans for 1979-82

D. 36. A five-year project concerning crop production on salt-affected soils will be initiated in 1981.

Co-operation with other organizations

D. 37. This programme component involves co-operation with UNDP, GSF, ICRISAT, and EAAFRO.

Plant breeding and genetics

OBJECTIVE

D. 38. The objective is to assist and advise Member States of the Agency and FAO in connection with the use of radiation and isotope techniques - based on concepts, procedures and methods developed through research - for the genetic improvement of crop plants.

PLANS FOR 1977-82

D. 39. The provision of assistance and advice to Member States will continue by means of correspondence, missions, training, conferences and publications. Research necessary in connection with the provision of advice will continue - administered through co-ordinated research programmes, guided by means of technical assistance projects or carried out at the Agency's Laboratory. The research programme will focus on the development of more efficient and economic systems for mutation induction and for the selection and utilization of mutants. The efforts to supply, by mutation induction, genetic stocks for use by plant breeders will continue. Priority will be given to the main food crops, including fruits and vegetables, and to certain industrial crops. Attention will be paid to achieving greater yields, better nutritional quality and higher resistance. Techniques will be improved in the light of advances in cytogenetics, molecular biology, in vitro culture work, plant physiology and biochemistry. Subject to the availability of funds, research contracts will be awarded with a view to intensifying research on the use of isotope tracer techniques in selection procedures. At present, approximately ten technical assistance projects are linked with this sub-programme.

STRUCTURE

D. 40. This sub-programme consists of three components, which are described in the following paragraphs.

Plant breeding and genetics

Summary by programme components

Table D. 6

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Grain protein improvement through nuclear techniques	0,8 (0,7)[a/]	0,6 (0,4)	44 500	-	10 000	600	55 100
Crop improvement through induced mutations	0,7 (0,8)	0,5 (0,4)	41 000	36 000	25 000	3 300	105 300
Development of technology for induced mutations	0,7 (0,7)	0,5 (0,4)	40 000	-	25 000	2 600	67 600
Linguistic, printing and publishing services	- -	- -	-	-	-	61 000	61 000
Data processing services	- -	- -	-	-	-	2 000	2 000
Laboratory services	- -	- -	-	-	-	154 000	154 000
TOTAL	2,2 (2,2)	1,6 (1,2)	125 500	36 000	60 000	223 500	445 000

a/ FAO staff in brackets.

Grain protein improvement through nuclear techniques

Objective

D.41. The objective is to increase the protein content of grains and achieve better protein quality through mutation induction and the selection of mutants and by the development of appropriate screening techniques (1970-78) and to evaluate such mutants genetically, nutritionally and agronomically (1972-80).

Results to date

D.42. In a co-ordinated research programme initiated in 1970 (Table D.11, No 5) and involving plant breeders, plant physiologists, agronomists, chemists and nutritionists, analytical procedures for screening mutants have been standardized and barley mutants with a substantially better amino acid balance and rice mutants with higher protein contents have been obtained. These mutants are being evaluated for agronomic performance and nutritional value. At the same time, they are being used extensively in cross-breeding.

Plans for 1977-78

D.43. This co-ordinated research programme - which involves at present 24 research contracts and agreements, with associated activities at five institutes in the Federal Republic of Germany and at a number of international and other national institutes, and also the provision of advisory services and training - will be phased out in 1978, with the termination of financial support from the Federal Republic of Germany. A symposium, supported by GSF, for reviewing the achievements of the co-ordinated research programme and relating them to the approaches adopted by other organizations will be held in 1978 (Symposium - Annex III (1)).

Related activities

D.44. The Agency's Laboratory will carry out supporting research, provide training in methodology and assist contractors with protein analyses.

Plans for 1979-82

D.45. The genetical, nutritional and agronomical evaluation of mutants obtained under the eight-year co-ordinated research programme is expected to continue until 1980. Resulting valuable stocks will be made available to plant breeders in Member States.

Co-operation with other organizations

D.46. This programme component involves co-operation with GSF, PAG, US-AID, USDA, ERDA, SIDA, ESNA and the international agricultural research institutes operating under the auspices of the Consultative Group on International Agricultural Research.

Crop improvement through induced mutations

Objective

D.47. The objective is to induce mutations and to isolate, select and evaluate mutants having improved characteristics and use them for developing improved crop cultivars - with emphasis on: increasing the disease resistance of cereals and certain other crop plants (1971-82); improving vegetatively propagated plants through somatic mutations (1972-82); increasing the productivity, disease resistance and nutritional quality of grain legumes (1976-81); and cross-breeding with short-stature cereal mutants (1977-82) - and to collect information about valuable mutant stocks and disseminate it through the Mutation Breeding Newsletter (since 1972).

Results to date

D. 48. Numerous lines of crop plants with desirable traits obtained through induced mutation are available for use by plant breeders. An increasing number of crop cultivars are derived from induced mutations either by direct propagation or by the use of mutants in cross-breeding. Improvements have been achieved in respect of characters such as disease resistance, lodging resistance, nutritional quality and environmental adaptability; the Joint FAO/IAEA Division in its advisory capacity has played an important role in achieving these improvements. The Mutation Breeding Newsletter, issued twice a year, informs scientists and practical breeders about research results, available improved genetic stocks and released mutant varieties.

Plans for 1977-78

D. 49 Emphasis will continue to be placed on increasing disease resistance (Symposium - Annex I (1)). A new programme, planned to start this year will focus particularly on grain legumes, which are important for human nutrition but frequently lack the plant characteristics required for sustained high grain yield. Work on the improvement of vegetatively propagated plants and woody perennials, a project of particularly long duration (Table D. 11, No. 7), is scheduled to continue until 1982. At the same time, there will be stronger emphasis on the transfer of desirable mutant genes into suitable highly productive genotypes for easier use by practical plant breeders (Table D. 11, No. 8). A co-ordinated research programme on inducing mutations for disease resistance, which is being carried out with financial support from SIDA and with the participation of 17 research institutes (Table D. 11, No. 6) will continue in 1977. The relevance of nuclear techniques in research for the improvement of rice production will be reviewed and plans for interdisciplinary projects will be developed at a regional seminar in South East Asia (Seminar - Annex I (3)).

Related activities

D. 50. There are several technical assistance projects concerned with crop improvement through induced mutations.

Plans for 1979-82

D. 51. As plant breeding is an open-ended and competitive activity, the programme for further crop improvement will continue. Subject to the availability of funds, two training courses, one study tour and one symposium may be held. Depending on advice received from experts, emphasis may be placed on oil seed crops or forage crops. Breeding for insect resistance will also be considered.

Co-operation with other organizations

D. 52. This programme component will involve co-operation with SIDA and with SABRAO, EUCARPIA, EPPO, ESNA and other plant breeding/plant genetics associations.

Development of technology for induced mutations

Objective

D. 53. The objective is to gain an insight into the action of mutagens on plant material, to develop appropriate techniques for detecting mutants with improved characteristics, and to examine mutants genetically (since 1969); to design a system for inducing and detecting rare mutations by employing cytogenetic techniques (1975-80); and to develop methods for mutation induction and mutant selection in haploid plants and in vitro cultures (1977-82).

Results to date

D. 54. Mutagen treatments of different plant species and different plant organs require knowledge about the sensitivity of the plant material, the penetration of the mutagen and

modifying factors and means for assessing standard treatment conditions. In all these areas useful results have been obtained, partly by the Agency's Laboratory and partly by scientists in Member States working under research agreements with the Agency. Research concerning screening techniques for disease resistance and for the chemical composition of grains has also been quite successful. The Agency's Laboratory has developed a semi-automatic method for screening large numbers of seed samples for protein content and protein quality.

Plans for 1977-78

D. 55. The work is directed primarily at providing the necessary technology for crop plant improvement through induced mutations. In line with the emphasis in the programme component entitled "Crop improvement through induced mutations", emphasis will therefore be placed on the technology of screening for disease resistance in a number of different crop plants, on methods of selection for obtaining highly productive grain legumes and on methods of isolating mutated tissues from plant chimeras (Table D.11, Nos 6 and 7). A co-ordinated research programme for the improvement of induced mutation techniques (Table D.11, No. 9) is based on research agreements. Following the initiation of a co-ordinated research programme for the use of aneuploid techniques in determining targets of mutation induction in wheat (Table D.11, No. 10), more emphasis may be placed on the employment of cytogenetic techniques for other purposes, such as developing male sterility for hybrid breeding.

Related activities

D. 56. The Agency's Laboratory will carry out supporting research, provide training in methodology and also provide irradiation services.

Plans for 1979-82

D. 57. It is planned that the co-ordinated research programme for the improvement of induced mutation techniques, which has been running since 1972 on a cost-free basis with research co-ordination meetings at two-yearly intervals, will continue. The programme for the use of aneuploids in wheat protein improvement will have achieved its primary aim (the determination of loci important for endosperm protein) by 1980 and may lead to mutation induction programmes focusing on particular chromosomes. It is anticipated that from 1977 it will be possible to place more emphasis on mutation techniques using haploids and in vitro cultures. New techniques will also have to be developed in connection with planned programmes for the improvement of oil seed crops and for the development of resistance to insects.

Co-operation with other organizations

D. 58. This programme component will involve co-operation with EUCARPIA, ESNA and EURATOM and also with phytopathological and entomological associations.

Animal production and health

OBJECTIVE

D. 59. 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 problems associated with nutrition, reproduction, adaptation and disease.

PLANS FOR 1977-82

D. 60. The work under this sub-programme will be directed towards the practical application of isotopes in animal production and health. The improvement of animal production and health through research with isotopes will be a subject for discussion at seminars and advisory group meetings. Three co-ordinated research programmes will concentrate on: (a) the use of isotopes in diagnosing mineral imbalances; (b) the use of radioimmune

techniques to improve reproductive efficiency; and (c) the use of isotopes in studying tick-borne diseases. Training courses on the use of isotopes in animal production and parasitology research will be held in alternate years, subject to the availability of funds. At present, approximately seven technical assistance projects are linked with this sub-programme.

STRUCTURE

D. 61. This sub-programme consists of two components, which are described in the following paragraphs.

Animal production and health

Summary by programme components

Table D. 7

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Isotope techniques in animal nutrition and physiology	0,6 (0,5)[a/]	0,3 (0,6)	42 100	-	23 000	3 500	68 600
Nuclear techniques in animal parasitology and disease control	0,6 (0,6)	0,4 (0,5)	46 500	16 000	33 000	1 900	97 400
Linguistic, printing and publishing services	- -	- -	-	-	-	36 000	36 000
TOTAL	1,2 (1,1)	0,7 (1,1)	88 600	16 000	56 000	41 400	202 000

a/ FAO staff in brackets.

Isotope techniques in animal nutrition and physiology

Objective

D. 62. The objective is to determine - by studying water metabolism - why certain breeds and species are more adaptable to environmental extremes (1974-79), to work out methods for detecting moderate mineral imbalances (1976-81) and to evaluate hormonal dysfunctions in relation to reproduction capabilities in farm animals (1976-81).

Results to date

D. 63. A programme on tracer techniques in studies on the use of non-protein nitrogen (NPN) in ruminants has been initiated (Table D.11, No. 13). Various techniques have been developed for and applied in measuring rumen microbial protein synthesis. This programme is being completed this year with a research co-ordination meeting. A programme on water requirements of tropical herbivores (with studies based on measurements with tritiated water) has been initiated and the first research co-ordination meeting held (Table D.11, No. 11). The training manual on the use of nuclear techniques in animal parasitology, immunology and pathophysiology has been revised. Two training courses and one study tour have been held.

Plans for 1977-78

D. 64. The programme on water requirements of tropical herbivores, which is concerned with how certain breeds and species survive in extreme environments, will continue and be reviewed at a research co-ordination meeting in 1977. A co-ordinated research programme on the use of isotopes in detecting moderate mineral imbalances will be developed following

an advisory group meeting this year. Methods will be sought for determining which are the limiting nutrients as animal production becomes more intensive ("production disease"). Studies of the use of isotopes in research aimed at improving the fertility of farm animals will be co-ordinated (Table D.11, No. 14). Oestrous synchronization and artificial insemination methods for improving the fertility of farm animals in the harsh environments of many developing countries will be sought. Some 30-36 institutes working under research contracts and agreements will participate in these co-ordinated research programmes.

Related activities

D.65. Animal nutrition and physiology problems are being studied in UNDP projects in Brazil, Cuba, India and Yugoslavia, and projects in other countries are pending. The Agency's Laboratory will carry out nitrogen-15 analyses. The feasibility of the activation analysis of feedstuffs from developing countries will be studied. A training course will be held in Latin America during 1977.

Plans for 1979-82

D.66. The techniques employed and results obtained in the programme on the use of isotopes in detecting moderate mineral imbalances in production disease will be used in determining whether production disease due to the intensification of agriculture in developing countries is a result of mineral deficiencies; these techniques could be used to diagnose several moderate mineral deficiencies simultaneously. Radioimmunoassay techniques will be used to assess fertility in domestic animals in harsh environments; the information obtained will be used in developing programmes for improving reproduction through oestrous synchronization and artificial insemination.

Co-operation with other organizations

D.67. This programme component will involve co-operation with UNDP, SIDA, the Centro Internacional de Agricultura Tropical, ILCA and the International Union of Nutritional Sciences.

Nuclear techniques in animal parasitology and disease control

Objective

D.68. The objective is to develop - through pathophysiological and immunological studies (1976-81) - diagnostic techniques for the early detection of disease, to investigate the epizootiology of tick-borne diseases and to devise control measures against ticks (1976-81).

Results to date

D.69. Since the initiation of a modified parasitology programme (Table D.11, No. 12) emphasis is being placed on studies of the immunological control of gastrointestinal and tissue parasites using labelled antigenic-active fractions and irradiated infectious stages of helminths. Work on the detection and identification of specific antibodies for diagnosing fascioliasis and cysticercosis is progressing. The isolation and maintenance in tissue cultures and atypic host animals of Theileria parva, the causative agent of East-Coast fever, have been achieved; work on techniques for transforming schistosomal metacercariae into schistosomulae in order to develop a stable vaccine against this disease is also progressing. A laboratory training manual on the use of nuclear techniques in animal parasitology, immunology and pathophysiology, was published in 1974.

Plans for 1977-78

D.70. Pathophysiological investigations relating to the control of protozoal blood diseases will be intensified; they may lead to a special co-ordinated research programme on ticks and tick-borne diseases in 1977 (Advisory Group - Annex II (3)). These activities will involve 12-15 research contracts and agreements.

Related activities

D. 71. Support will be provided for technical assistance projects in several countries through help in planning and executing programmes for the diagnosis, control and eradication of parasitic diseases. A training course on pathophysiology and immunology is planned for 1977, in co-operation with ILRAD. Research on problems of feeding and rearing tsetse flies will continue, in co-operation with the Agency's Laboratory.

Plans for 1979-82

D. 72. Efforts will be centred on improving diagnostic techniques, on the investigation of pathophysiological changes in the host organism during parasitic infection and on artificially induced immunological control of helminthic and protozoal parasites with high antigenic and immunogenic properties. Further research relating to the development of radiation-attenuated vaccines against schistosomiasis, cysticercosis and possibly blood protozoans is foreseen.

Co-operation with other organizations

D. 73. This programme component involves co-operation with ILRAD.

Insect and pest control

OBJECTIVE

D. 74. 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. The current programme deals with insect control.

PLANS FOR 1977-82

D. 75. In the use of the sterile-insect technique for the control of plant-feeding insects, the emphasis will be on field applications and related aspects. Additional plant-feeding insects will be considered in the light of the recommendations of advisory groups. Technical support will be given to Mediterranean fruit fly control campaigns based on use of the sterile-insect technique and for field demonstrations of the use of this technique against the olive fly. The co-ordinated programme on fruit fly eradication or control (Table D.11, No. 15) ends this year with a final research co-ordination meeting; it will be replaced by one emphasizing the practical application of the sterile-insect technique and supporting techniques such as the use of genetic mechanisms for sex ratio distortion. The co-ordinated research programme on use of the sterile-male technique for the control of lepidopterous insects attacking tree fruit (Table D.11, No. 16) will be directed towards field applications. In the case of tsetse flies, as soon as the rearing technology is sufficiently developed and other requirements for using the sterile-insect technique have been met, releases directed against a number of species will be carried out in Africa. The use of radioisotopes and radiolabelled insecticides in pest management studies, with particular emphasis on rice insects, is expected to increase. Subject to its being recommended by an advisory group in 1977 (Advisory Group - Annex II (4)), a programme on the mutation breeding of specific plants for resistance to insect attacks will be initiated. The information circular Radiation Techniques and their Application to Insect Pests will continue to appear, its coverage including mechanisms for genetically controlling plant-feeding insects. Advisory group, consultant and research co-ordination meetings on various other questions are planned. This sub-programme has been modified to take into account the termination of the work on the Heliothis complex and the shift in emphasis to field applications of the sterile-insect technique in the control of plant-feeding insects and to pest management. Great stress will continue to be laid on tsetse flies. An international training course on the use of isotopes and radiation in entomology is planned for 1977.

STRUCTURE

D. 76. This sub-programme consists of three components, which are described in the following paragraphs.

Insect and pest control

Summary by programme components

Table D. 8

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Development of the sterile-male technique against plant-feeding insects	0,8 (0,4)[a]	0,5 (0,5)	42 000	-	30 000	1 700	73 700
Development of the sterile-insect technique against the tsetse fly and other biting flies	0,7 (0,4)	0,5 (0,5)	35 000	-	25 000	2 100	62 100
Use of isotopes and radiation in insect pest management	0,6 (0,4)	0,3 (0,2)	29 500	16 000	10 000	1 700	57 200
Linguistic, printing and publishing services	- -	- -	-	-	-	45 000	45 000
Data processing services	- -	- -	-	-	-	3 000	3 000
Laboratory services	- -	- -	-	-	-	543 000	543 000
TOTAL	2,1 (1,2)	1,3 (1,2)	106 500	16 000	65 000	596 500	784 000

a/ FAO staff in brackets.

Development of the sterile-male technique against plant-feeding insects

Objective

D. 77. The objective is to develop the sterile-insect technique for practical application against fruit flies (1968-1980), with work on the development of techniques for optimizing such application, and to develop the sterile-insect technique with a view to the control of lepidopterous insects attacking tree fruit (1974-79).

Results to date

D. 78. Effective control of Mediterranean fruit flies by the sterile-insect technique has been demonstrated in several Mediterranean countries and in the United States, and mass production and release techniques have been optimized. There has been considerable improvement in the production of the olive fly, and control by the sterile-insect technique has been demonstrated in the field in Greece. Control of the codling moth by sterile releases has progressed in Europe. The programme on the Heliothis complex has been terminated because the artificially produced insect was insufficiently competitive, even prior to irradiation.

Plans for 1977-78

D. 79. After the results of the co-ordinated research programme on fruit fly eradication or control by the sterile-male technique (Table D.11, No. 15) have been reviewed, a programme will be initiated which emphasizes the practical application of the sterile-insect

technique against fruit flies and techniques for optimizing such application (for example, the use of genetic mechanisms for sex ratio distortion). The co-ordinated research programme on lepidopterous insects attacking tree fruits (Table D.11, No. 16) is to continue, with increased emphasis on field aspects of the sterile-insect technique. Approximately 20 institutes will be involved in this work.

Related activities

D. 80. The Agency's Laboratory will carry out research and provide training in support of this component.

Plans for 1979-82

D. 81. Additional plant-feeding insects will be considered for inclusion in this component, subject to the recommendations of advisory groups.

Co-operation with other organizations

D. 82. This programme component involves co-operation with UNDP, EPPO, IOBC and USDA.

Development of the sterile-insect technique against the tsetse fly and other biting flies

Objective

D. 83. The objective is to develop the sterile-insect technique for practical application in eradicating or controlling the tsetse fly (1970-1980).

Results to date

D. 84. Much progress has been made in rearing tsetse flies fed through a membrane; measures to prevent and control disease in laboratory colonies have been developed and irradiation procedures improved. Work on the stable fly has been discontinued due to insufficient interest in developing countries affected by this pest.

Plans for 1977-78

D. 85. With a view to greater efficiency and lower costs, the rearing of tsetse flies without living hosts will be developed to the point where the methods are readily usable in pilot projects. Studies on pathogenesis will be pursued (Table D.11, No. 17). Better methods of blood preparation and preservation will be developed and nutrition problems studied. The competitiveness of tsetse flies sterilized by various methods will be determined. Ecological studies of some target species will be conducted and methods for handling these species developed. About 15 institutes will participate in these activities, a review of which is planned for 1977.

Related activities

D. 86. The Agency's Laboratory will carry out research and provide training in support of the activities comprising this programme component.

Plans for 1979-82

D. 87. As soon as the mass rearing technology is sufficiently developed, the ecological studies have yielded enough results and other requirements for use of the sterile-insect technique have been met, programmes for tsetse fly control in the field will be carried out; the countries where such programmes are most likely to be carried out include Nigeria, Tanzania and Upper Volta. In addition, genetic mechanisms will be tested with a view to increasing the effectiveness of the sterile-insect technique.

Co-operation with other organizations

D. 88. This component involves co-operation with WHO, UNEP and ICIPE and with US-AID, GSF and other national organizations.

Use of isotopes and radiation in insect pest management

Objective

D. 89. The objective is to solve specific important pest management problems such as those relating to the optimization of insecticide application timing and methods, to target insect ecology and to genetic control (1975-81).

Plans for 1977-78

D. 90. An advisory group, which is to be convened in 1977 (Advisory Group - Annex II (4)), will consider the feasibility of developing resistance to insects in certain crop plants through mutation breeding - a subject to be treated within this programme component and the "Insect and pest control" sub-programme. Some ten institutes will participate in a co-ordinated research programme. In order to ensure rapid application of the results, some of the institutes will be located where the target pests are prevalent.

Related activities

D. 91. The Agency's Laboratory will carry out research and provide training in support of this component.

Plans for 1979-82

D. 92. If the results of the activities comprising this component are satisfactory, field demonstrations of pest management will be carried out by appropriate organizations.

Co-operation with other organizations

D. 93. This programme component involves co-operation with WHO, UNEP, ESNA and IOBC.

Chemical residues and pollution

OBJECTIVE

D. 94. The objective is to assist and advise Member States of the Agency and FAO in connection with the safe and effective use of isotope and irradiation techniques in solving agriculture, food and fishery problems.

PLANS FOR 1977-82

D. 95. Co-ordinated research programmes dealing with undesirable side-effects of agrochemical residues, trace contaminants in edible seeds and oils, the conservation and fate of useful nitrogen residues in soil and the protection of food, soil and inland water quality will be expanded, as will the collection and publication of comparative data; the recruitment of an additional Professional staff member is envisaged. At present, three technical assistance projects are linked with this sub-programme.

STRUCTURE

D. 96. The sub-programme consists of three components, which are described in the following paragraphs.

Chemical residues and pollution

Summary by programme components

Table D. 9

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Isotope-aided studies of the origin, fate and biological significance of chemical residues in food and agriculture	0,6 (0,8)[a/]	1,1 (0,1)	36 700	-	10 000	2 300	49 000
Isotope tracer-aided studies of chemical residues - micro-biological interactions involving aquatic ecosystems	0,3 (0,8)	0,6 (0,1)	18 300	-	18 000	1 700	38 000
Collection and dissemination of comparative information on the fate and significance of foreign substances (including radioactive substances) in food and agriculture	0,3 (0,5)	0,6 (-)	18 000	-	18 000	-	36 000
Linguistic, printing and publishing services	- -	- -	-	-	-	37 000	37 000
Data processing services	- -	- -	-	-	-	3 000	3 000
TOTAL	1,2 (2,1)	2,3 (0,2)	73 000	-	46 000	44 000	163 000

a/ FAO staff in brackets.

Isotope-aided studies of the origin, fate and biological significance of chemical residues in food and agriculture

Objective

D. 97. The objective is to identify and advise on means of minimizing undesirable side-effects of agrochemical residues (1974-79) and to improve agrochemical and soil management practices which will minimize the role of fertilizer nitrogen residues as potential pollutants in food, feed or water (1974-80) - see also the "Soil fertility, irrigation and crop production" sub-programme.

Results to date

D. 98. New information and data on the behaviour and significance of trace contaminants have been obtained as input for the development of recommended control measures at the international level and for the safe and effective use of agrochemicals. Problems of importance to developing countries have been identified and tackled. Three related training courses have been held, with considerable success, and the preparation of a comprehensive laboratory training manual undertaken.

Plans for 1977-78

D. 99. Research dealing with trace contaminants in edible seeds and oils, agricultural nitrogen residues and the undesirable side-effects of agrochemical residues will be co-ordinated (Table D.11, Nos 20, 4, 18 and 19). Programmes on chemical residue-soil biota interactions are being initiated; the first results will be reviewed in 1978 (Advisory Group).

Related activities

D.100. Support services will be provided for developing countries through FAO and Agency technical assistance activities and through training courses for scientists.

Plans for 1979-82

D.101. Increasing attention will be paid to the problems of conserving soil resources and to the significance of chemical residue-biota interactions. Further training courses are planned and a laboratory training manual will be published.

Co-operation with other organizations

D.102. Besides close liaison with sponsoring countries (for example, the Federal Republic of Germany and Sweden) under bilateral agreements, co-operation will be maintained with United Nations organizations (for example, UNESCO, WHO, UNDP, UNEP and UNSCEAR), intergovernmental organizations (for example, EURATOM) and non-governmental organizations (for example, EPPO, the International Academy of Environmental Safety and ESNA).

Isotope-tracer-aided studies of microbiological interactions invloving chemical residues in aquatic ecosystems

Objective

D.103. The objective is to provide a basis for developing methods for protecting inland water quality (1975-80).

Plans for 1977-78

D.104. The "primary production" in inland water bodies and their capacity to receive man-caused contaminants or excessive nutrients without unacceptable effects will be studied and co-ordinated (Table D.11, No. 21).

Related activities

D.105. Support services will be provided for developing countries through technical assistance programmes and training courses.

Plans for 1979-82

D.106. It is planned to relate the information and data obtained with those obtained in other food and agriculture studies in order to assess the existing and potential impact of agricultural practices on inland water quality.

Co-operation with other organizations

D.107. Besides close liaison with sponsoring countries (for example, the Federal Republic of Germany and Sweden) under bilateral agreements, co-operation will be maintained with United Nations organizations (for example, UNESCO, WHO, UNDP, UNEP and UNSCEAR), intergovernmental organizations (for example, EURATOM) and non-governmental organizations (for example, EPPO, the International Academy of Environmental Safety and ESNA).

Collection and dissemination of comparative information on the fate and significance of foreign substances (including radioactive substances) in food and agriculture

Objective

D.108. The objective is to compile, evaluate and make a comparative review - on the basis of a provisionally established uniform scheme - of data on foreign chemicals

(including radioactive substances) which appear in food, the environment and the tissues of organisms (1973-80).

Results to date

D.109. Comparative summaries of selected information and data relating to inputs, fate and biological significance of a range of chemical and radioactive trace contaminants have been prepared and published.

Plans for 1977-78

D.110. Further summaries will be prepared and published.

Related activities

D.111. Liaison and information exchange with national and international environmental information centres.

Plans for 1979-82

D.112. The publication of comparative summaries in the form of collected monographs, including a multilingual glossary of important terms and definitions, as an aid to environmental scientists is planned.

Food preservation

OBJECTIVE

D.113. The objective is to assist and advise Member States of the Agency in connection with facilitating the practical application of food irradiation where this produces a wholesome product and offers clear economic and technological advantages. As, for a number of foods, the above requirements appear to have been met, the most important immediate goal is the achievement, through collaboration with WHO and FAO, of the general acceptance of irradiated foods, which it has not been possible to achieve in past years.

PLANS FOR 1977-82

D.114. In agreement with FAO and WHO, a plan of action has been prepared for clarifying the main wholesomeness aspects before the next six-year period. Work will then be concentrated mainly on the practical application of food irradiation in Member States. Efforts will be made to achieve global consensus on public health acceptance and the industrial introduction of this food preservation technique. World-wide approval of the food irradiation process by public health authorities will be a subject for discussion at seminars and advisory group meetings. Three co-ordinated research programmes will concentrate on: (a) the technological and economic feasibility of the radiation preservation and sanitation of fruits, vegetables, grains and condiments; (b) the preservation of fish and fishery products; and (c) the wholesomeness of the food irradiation process. Special missions will be undertaken to advise Member States, upon request, on organizing and conducting the irradiation of food and animal feed. Regional seminars on food irradiation are planned to take place annually, subject to the availability of funds. It is planned to convene advisory group meetings annually and to hold consultations with WHO on food irradiation at least twice a year. There are plans to hold training courses on food irradiation technology and techniques at two-yearly intervals. At present, six technical assistance projects are linked with this sub-programme.

STRUCTURE

D.115. This sub-programme, which has been restructured to reflect the phasing-out of the basic microbiological and biochemical research work, now consists of two components, which are described in the following paragraphs.

Food preservation

Summary by programme components

Table D. 10

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Technological and economic feasibility of food irradiation	2,4 (0,1)[a]	0,2 (1,1)	106 400	16 000	30 000	2 300	154 700
Public health acceptance and regulatory aspects of the process of food irradiation	1,7 (0,1)	0,2 (1,0)	74 100	-	20 000	1 200	95 300
Costs of meetings not attributable to an individual programme component	- -	- -	-	25 000	-	-	25 000
Linguistic, printing and publishing services	- -	- -	-	-	-	70 000	70 000
TOTAL	4,1 (0,2)	0,4 (2,1)	180 500	41 000	50 000	73 500	345 000

a/ FAO staff in brackets.

Technological and economic feasibility of food irradiation

Objective

D.116. The objective is to collaborate in the implementation of projects for extending the shelf-life of important food items and in the pilot-scale irradiation of certain food products through the rigorous examination - with emphasis on competitiveness - of technological feasibility, economics and energy requirements (1974-79).

Results to date

D.117. Technical feasibility studies involving small-scale and pilot-scale experiments have shown the potential advantages of irradiation in processing a number of food items of appreciable economic importance. One Member State has commercialized an irradiated food item (potatoes) on an industrial scale, which should stimulate the use of the irradiation process in other countries. The Asian Regional Project on Radiation Preservation of Fish and Fishery Products (RPF) was formally established in 1965 as part of the Agency-initiated Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA). Six of the ten signatories of RCA are participating in RPF at present.

Plans for 1977-78

D.118. Technical assistance under the Regular Budget and from UNDP funds will be sought for RPF. Endeavours will continue to bring about an agreement between FAO, the Netherlands Government and the Agency to carry out pilot-scale feasibility studies (mainly on fishery products, grain, fruits and vegetables) by operating an international facility for food irradiation technology. Special attention will be paid to training the operators of food irradiation facilities. Regional co-ordination meetings will be held as appropriate to evaluate RPF results and to formulate plans for collaboration. The technological and economic feasibility of animal feed irradiation will be considered in 1977 (Advisory Group - Annex II (5)). An advisory group on fish irradiation is planned for 1978. Progress in the use of radiation in food preservation will be reviewed in 1977 (Symposium - Annex I (2)).

Research at selected laboratories on the technological and economic feasibility of food irradiation (Table D.11, No. 22) will be co-ordinated, with a research co-ordination meeting in 1977, as will research on the radiation preservation of Asian fish and fishery products (Table D.11, No. 24), with a research co-ordination meeting in 1978. Subject to the availability of funds, regional seminars on food irradiation in Asia, Europe, Africa or Latin America are planned.

Related activities

D.119. Subject to the availability of funds, a training course on food irradiation technology is planned for 1978. Support services will be provided for technical assistance projects. The Agency's Laboratory will provide training and carry out research in support of this component.

Plans for 1979-82

D.120. It is planned to continue and extend the activities described under "Plans for 1977-78", and a symposium, advisory group meetings and training courses may be necessary for this purpose. Emphasis will be placed on larger-scale pilot-plant experiments and commercialization studies.

Co-operation with other organizations

D.121. This programme component involves co-operation with the Commission of the European Communities and CMEA. Co-operation with international scientific societies and unions such as ESNA, the International Union of Food Science and Technology and IUPAC concerning both scientific and public relations questions is also envisaged.

Public health acceptance and regulatory aspects of the process of food irradiation

Objective

D.122. The objective is to assist in achieving general acceptance of the food irradiation process as a means of reducing world food losses.

Results to date

D.123. Large-scale, long-term wholesomeness experiments, some performed as part of the International Project in the Field of Food Irradiation (IFIP), have failed to demonstrate any harmful effects of irradiated food. At present, 25 food items have been given limited or unlimited public health clearance in 18 countries.

Plans for 1977-78

D.124. Participation in IFIP will continue following the recent extension of the project. In 1978, a joint FAO/IAEA/WHO expert committee will review wholesomeness data with a view to accelerating the issuance of national public health clearances for commodities like beef, pork and ham. Intensive collaboration with WHO and the FAO/WHO Codex Alimentarius programme, and also with the appropriate bodies of the Commission of the European Communities and CMEA, is foreseen, the aim being to generate international agreement on the wholesomeness and acceptability of the food irradiation process. Public health and consumer acceptance studies will be attempted in co-operation with IIASA. Research at selected laboratories on the wholesomeness of the food irradiation process will be co-ordinated (Table D.11, No. 23), with a research co-ordination meeting in 1978. Regulatory aspects of food irradiation will be reviewed in 1977 in co-operation with the Legal Division (Advisory Group - Annex II (91)).

Related activities

D.125. Support services will be provided for technical assistance projects.

Plans for 1979-82

D.126. Activities will be concentrated on achieving global acceptance of the food irradiation process.

Co-operation with other organizations

D.127. Co-operation in wholesomeness problems with WHO, OECD(NEA) and the Codex Alimentarius Commission of the Joint FAO/WHO Food Standards Programme is an important part of this programme component.

Co-ordinated research programmes

Table D. 11

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. Fertilizer efficiency studies on grain legumes	9	4	1972	1977
2. Isotope-aided micronutrient studies in rice production with special reference to zinc deficiencies	8	2	1973	1978
3. Use of radiation and isotope techniques in studies of soil-water regimes	8	5	1972	1977
4. Agricultural nitrogen residues with particular reference to their conservation as fertilizers and behaviour as potential pollutants	10	9	1975	1980
5. Use of nuclear techniques for seed protein improvement	18	8	1970	1978
6. Use of induced mutations for disease resistance in crop plants	9	8	1970	1977
7. Improvement of vegetatively propagated crops and tree crops through induced mutations	7	4	1972	1982
8. Use of radiation-induced mutations in rice breeding and production	1	6	1971	1977
9. Improvement of mutation breeding techniques	-	11	1972	1982
10. Use of aneuploids for wheat protein improvement	8	-	1975	1980
11. Water requirements of tropical herbivores	8	2	1974	1978
12. Isotopes and radiation in animal parasitology and immunology	5	6	1973	1978

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
13. Use of tracer techniques in studies on the use of non-protein nitrogen in ruminants	5	8	1972	1976
14. The use of competitive protein binding with labelled steroids and bioimmunoassay techniques in studies of productive physiology and pathology of domestic animals	This programme has been approved but no contract has yet been awarded		1975	1980
15. Fruit fly eradication or control by the sterile-male technique	14	2	1969	1976
16. Use of sterile-male technique for control of lepidopterous insects attacking tree fruits	6	3	1972	1978
17. Control or eradication of the tsetse fly by the sterile-male technique	5	7	1970	1977
18. Isotope-tracer-aided studies of foreign chemical residues in food	6	2	1973	1978
19. Tracer-aided studies of the biological side-effects of foreign chemical residues in food and agriculture	6	6	1973	1978
20. Isotope-tracer-aided studies of chemical residues in cotton seed, oils, feeds and related products	7	-	1974	1978
21. Co-ordinated isotopic-tracer-aided research and monitoring programme on agricultural residue-biological interactions in aquatic systems	This programme has been approved but no contract has yet been awarded		1976	1981
22. Technological and economic feasibility of food irradiation	5	1	1974	1979
23. Wholesomeness of the process of food irradiation	6	2	1974	1979
24. Radiation preservation of Asian fish and fishery products	7	-	1974	1979

E. LIFE SCIENCES

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table E. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	482 310	494 000	57 000	30 000	87 000	581 000	650 000
Consultants	24 949	32 000	900	(4 400)	(3 500)	28 500	35 500
Overtime	-	-	-	300	300	300	400
Temporary assistance	-	1 500	100	100	200	1 700	1 800
Sub-total	507 259	527 500	58 000	26 000	84 000	611 500	687 700
Common staff costs	144 418	144 400	21 600	11 000	32 600	177 000	196 000
Travel	21 625	21 000	1 000	-	1 000	22 000	34 000
Meetings							
Conferences, symposia, seminars	53 771	58 000	3 000	1 000	4 000	62 000	104 000
Technical committees, advisory groups	14 324	44 000	2 000	11 000	13 000	57 000	66 000
Representation and hospitality	2 023	4 100	600	800	1 400	5 500	5 300
Scientific and technical contracts	261 614	359 000	18 000	10 000	28 000	387 000	474 000
Scientific supplies and equipment	1 151	-	-	-	-	-	-
Common services, supplies and equipment	-	-	-	-	-	-	1 000
Transfer of costs:							
Linguistic services	78 176	34 000	4 000	22 000	26 000	60 000	67 000
Printing and publishing services	189 214	199 000	14 000	19 000	33 000	232 000	260 000
Data processing services	14 878	30 000	2 000	(17 000)	(15 000)	15 000	20 000
Laboratory services	295 000	265 000	20 000	30 000	50 000	315 000	338 000
TOTAL	1 583 453	1 686 000	144 200 8.6%	113 800 6.7%	258 000 15.3%	1 944 000	2 253 000

SUMMARY OF MANPOWER

Table E. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	4	5	5	-	5	5
P-4	6	6	7	-	7	8
P-3	1	1	1	-	1	1
P-2	1	1	1	-	1	1
P-1	1	-	-	-	-	-
Sub-total	14	14	15	-	15	16
GS	10	10	10	-	10	10
TOTAL	24	24	25	-	25	26

CHANGES IN COSTS AND MANPOWER

Costs

E.1. As will be seen from Table E.1 above, it is expected that the cost of this programme will increase by $258 000 in 1977, of which $144 200 will be required to cover salary and other price increases and $113 800 will be a programme increase.

E.2. A programme increase of $41 000 is foreseen in respect of salaries for established posts and common staff costs in respect of a P-4 post for the new sub-programme entitled "Health-related environmental research", which has been made available by transfer from another programme in the adjusted manning table for 1976.

E.3. Small increases in respect of overtime and temporary assistance are by far offset by a decrease for consultants' services.

E.4. The programme increase of $10 000 in respect of scientific and technical contracts is attributable to the establishment of the "Health-related environmental research" sub-programme.

E.5. Although an increase in meetings from two in 1976 to three in 1977 is foreseen in respect of conferences, symposia and seminars, there is only a programme increase of $1000, mainly due to the fact that no interpretation will be provided for seminars in 1977. The programme increase of $11 000 in respect of technical committees and advisory groups is required because it is intended to hold six meetings in 1977 as compared with four foreseen in the 1976 budget. A small increase in hospitality funds is required for the additional meetings.

E.6. Increased requirements for linguistic services ($22 000) and printing and publishing services ($19 000) are attributable mainly to the "Medical applications" and the "Health-related environmental research" sub-programmes. A decrease of $17 000 is expected for data processing services, and an increase of $30 000 for laboratory services. The latter is due mainly to the apportioning of the construction cost of the annex to the laboratory.

E.7. The Government of the United States of America is supporting the activities under the "Instrumentation requirements for nuclear medicine in developing countries" component by a special contribution of about $68 500 for the biennial period 1976-77.

Manpower

E.8. The manpower requirements of the "Health-related environmental research" sub-programme have been met by a transfer of a P-4 post from another programme in the adjusted manning table for 1976 and an internal re-allocation of posts within the programme.

E.9. As will be seen from Table E.2 above, one additional P-4 post is foreseen for 1978 for the "Medical applications" sub-programme for assistance in the work on instrumentation for medical diagnosis and research with radionuclides in the developing countries. It has been hoped to obtain outside manpower support for this project from Member States and international bodies such as IIASA, and a cost-free expert for one year has now been promised. In the absence of further assistance, the addition of the above P-4 post will be required from 1978 on for a period of about three years.

THE PROGRAMME

OBJECTIVE

E.10. The objective is to foster the development of methods and techniques for the application of radioisotopes in medicine, biology and health-related environmental research and to promote techniques for improving accuracy in radiation dosimetry. This programme is the subject of periodic consultations between the Agency and WHO. It is the continuing policy of the Agency to hand over to WHO at the appropriate time those activities in the programme which relate to procedures whose applications have become routine.

STRUCTURE

E.11. This programme consists of four sub-programmes, which are dealt with separately below.

Summary of manpower and costs by sub-programme

Table E.3

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years P	Man-years GS	Costs	Man-years P	Man-years GS	Costs
Medical applications	3.2	2.2	895 000	4.2	2.2	961 000
Dosimetry for intentional radiation applications	4.3	4.3	405 000	4.3	4.3	472 000
Radiation biology	4.3	2.3	485 000	4.3	2.3	654 000
Health-related environmental research	3.2	1.2	159 000	3.2	1.2	166 000
TOTAL	15.0	10.0	1 944 000	16.0	10.0	2 253 000

SUB-PROGRAMMES

Medical applications

OBJECTIVE

E.12. The objective is to provide advice and assistance to Member States, particularly developing countries, in acquiring techniques appropriate to the use of radionuclides in preventive and clinical medicine and in medical research, and, in collaboration with WHO, to guide their introduction into applications of local importance.

PLANS FOR 1977-82

E.13. The programme for the six-year period contains a new emphasis on a systematic exploration of applications, design and maintenance of nuclear medicine instrumentation as appropriate for conditions found in developing countries This will provide guidance in determining the most rewarding points of focus for the sub-programme in future years,

and increase the effectiveness with which currently popular applications of radionuclides may be carried out in the developing countries. Emphasis will continue to be placed on the development of radionuclide techniques of greatest utility in in-vitro applications, in-vivo applications, and neutron activation analysis. An attempt will be made to bring about the effective application of these techniques in dealing with medical problems of importance in developing countries, and the development of competent manpower will be promoted through training courses and the technical assistance programme of the Agency.

STRUCTURE

E.14. This sub-programme consists of four components, which are described in the following paragraphs.

Medical applications

Summary by programme components

Table E.4

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Instrumentation requirements for nuclear medicine in developing countries	0.7	0.7	60 100	-	40 000	2 200	102 300
Technical improvement of in vitro assay procedures with radioactive agents	1.0	0.5	54 200	34 000	65 000	2 600	155 800
Technical improvement of in vivo procedures with radioactive agents	1.0	0.6	51 300	9 000	46 000	1 900	108 200
Activation analysis of elements of biological significance	0.5	0.4	27 100	-	37 000	1 600	65 700
Linguistic, printing and publishing services	-	-	-	-	-	158 000	158 000
Data processing services	-	-	-	-	-	5 000	5 000
Laboratory services	-	-	-	-	-	300 000	300 000
TOTAL	3.2	2.2	192 700	43 000	188 000	471 300	895 000

Instrumentation requirements for nuclear medicine in developing countries

Objective

E.15. The objective is to stimulate a more effective utilization of nuclear medicine instrumentation in the developing countries by identifying the most rewarding applications (during the period 1976-78), by formulating recommendations for optimum design of instruments for such applications under the conditions found in tropical countries (1976-81) and by devising improved strategies for instrument maintenance (1976-79).

Results to date

E.16. This component was established in 1975 in response to encouragement by and with supplementary financial support from the Government of the United States of America. During 1975 advice regarding the programme of the component was obtained from several consultants, and an advisory group meeting was organized on strategies for instrument maintenance. In earlier years much of the work undertaken in this sub-programme had been closely related to the same objectives. Numerous advisory groups and panels have given guidance as to priorities of radioisotope applications in the medical field. Instruments and techniques have been compared in the Agency's Laboratory and under research contracts and research agreements. Simple whole-body counters have been designed and built. Support has been provided to instrument maintenance projects under the technical assistance programme. A registry has been compiled of nuclear medicine staff, equipment, and applications in about 250 nuclear medicine laboratories in developing countries.

Plans for 1977-78

E.17. A systematic survey of nuclear medicine applications will be made, in collaboration with outside experts and WHO, to identify the relative importance of various nuclear medicine applications in the health context in developing countries and the types of instruments required to carry out such applications. Based upon the preliminary findings of the survey, and with the aid of consultants and technical contracts, a review will be made of the potential of each of the major instrument systems for performing selected important applications, and also of the design features that would permit those systems to do so at a minimum cost. Steps will be taken to implement recommendations regarding strategies for improving maintenance. While in 1977 the services of a cost-free expert will be made available by the Government of the United States of America, a manning table post at the P-4 level may have to be added in 1978, if the cost-free services are not extended. It is proposed that in 1978 the preliminary findings of the programme be publicized and explored in a seminar, and that plans for the next steps be formulated in an advisory group meeting.

Related activities

E.18. The entire sub-programme, the Agency's technical assistance activities in nuclear medicine, and the Agency-organized training courses in maintenance of nuclear electronic instruments will benefit from this component. Tests and intercomparisons of selected items of equipment will be conducted by the Laboratory.

Plans for 1979-82

E.19. It is expected that all studies on maintenance problems will be concluded in 1979, while the formulation of recommendations as to instrument design will be continued into 1981. As instrumentation undergoes continuing and rapid development, it will be appropriate by 1980 to examine whether a new activity in a related area could profitably be initiated.

Co-operation with other organizations

E.20. Advice from WHO will be sought in the evaluation of the importance of alternative nuclear medicine applications. Contact with the International Electrotechnical Commission will be maintained in regard to instrument design specifications.

Technical improvement of in-vitro assay procedures with radioactive agents

Objective

E.21. The objective is to intercompare and to test the effectiveness of selected procedures for in-vitro assay of biologically relevant substances, and in collaboration with WHO, to guide their application to the solution of health problems of importance in developing countries In particular, the suitability and reliability of assay kits will be

studied, especially for thyroid studies (during the period 1977-82) and the effectiveness of in-vitro techniques in dealing with a particular health problem (e g. parasitic diseases) in tropical regions will be tested (1977-82).

Results to date

E.22. This component was initiated in 1969. A co-ordinated research programme on radioisotope techniques and their application in immunological studies of communicable diseases, organized in response to initiatives from WHO, was completed in 1975. It demonstrated the possibility of determining immunological status by such methods, although specificity remains a problem as with other procedures. A panel meeting on this subject was held in 1971. Two co-ordinated research programmes, one on in-vitro techniques, especially radioimmunoassay, and the second one on in-vitro procedures for studies in reproductive physiology, are in progress (Table E.8, Nos 1 and 2). A panel meeting on standardization of radioimmunoassay procedures was held in 1972, and three training courses on radioimmunoassay techniques have been organized (1971, 1974 and 1975). A symposium on radioimmunoassay and related procedures in medicine was held in 1973.

Plans for 1977-78

E.23. An investigation will be initiated into the suitability and reliability of kits for in vitro assays, concentrating first on those designed for thyroid studies (the currently most active area) (Advisory Group - Annex II (11)). It will probably include a programme of inter-laboratory comparisons supported in part by a new co-ordinated research programme. For 1977 it is planned that a new project will be selected in consultation with WHO, possibly in the area of parasitic diseases, as a focus for development and application of radioimmunoassay techniques. A further symposium will be organized in 1977 in the series on radioimmunoassay and related procedures in medicine (Annex I (4)).

Related activities

E.24. It is expected that the present level of nine technical assistance projects related to this component will be maintained. Subject to the availability of funds, a further training course is planned for 1977.

Plans for 1979-82

E.25. The investigation of assay kits for in-vitro assay is expected to be completed in 1981, and the new programme focusing on applications in a particular disease area is likely to be completed by the end of this period. Further training courses will be held, and an advisory group will be called to give direction to this component in the light of advances in radioimmunoassay and competing techniques.

Co-operation with other organizations

E.26. Close co-operation will continue to be maintained with WHO.

Technical improvement of in-vivo procedures with radioactive agents

Objective

E.27. The objective is to intercompare and to test the effectiveness of selected procedures for the use of radioisotopes in vivo for purposes of investigation and, in collaboration with WHO, to guide their application to the solution of health problems of importance in developing countries. In particular, procedures for investigating the causes and the alleviation of gastro-intestinal malabsorption will be refined and applied (during the period 1976-78) and techniques for studying kidney function will be compared (1977-79).

Results to date

E.28. Symposia have been held on medical radionuclide imaging (in 1972 and this year) and on dynamic studies with radionuclides (in 1970 and 1974). Meetings have been held on the measurement of radioiodine uptake in the thyroid (in 1971) and on diagnostic applications of radioisotopes in haematology (in 1973). Expert Committee meetings and seminars have been organized jointly with WHO on the medical uses of radioisotopes (in 1971), on training of radioisotope technicians (in 1971) and medical physicists (in 1972), and on nuclear medicine (in 1975). A joint IAEA/WHO co-ordinated research programme on iron nutrition has been completed (in 1975) after significantly improving techniques for assessing iron absorption from the diet. A co-ordinated research programme has been organized on techniques for processing and displaying data in scintigraphy.

Plans for 1977-78

E.29. A joint IAEA/WHO co-ordinated research programme on gastro-intestinal malabsorption is expected to be established this year, and will be expanded in 1977-1978. Emphasis will be on the testing of radioisotope techniques (whole-body counting, breath analysis of $^{14}CO_2$, and others) for assessing gastro-intestinal malabsorption of several nutrients, and on applications of these techniques to clarify causes of gastro-intestinal malabsorption in population groups and the effects thereon of various remedial measures. Further areas in radioisotope haematology will be examined in 1977 in collaboration with the International Committee for Standardization in Haematology (ICSH) (Technical Committee - Annex II (6)). A project will be initiated in 1977 with the assistance of consultants to review and compare radioisotope techniques for the study of kidney function. It is expected that an interlaboratory comparison will be conducted thereafter of techniques for performing such measurements and interpreting the results.

Related activities

E.30. This component supports work carried out under the Agency's technical assistance programme (at present: ten technical assistance projects). It will be supported in part by the Medical Applications Section of the Agency's Laboratory. Work in the Laboratory on the monitoring of contamination of Agency staff by plutonium and other radionuclides is related to this component.

Plans for 1979-82

E.31. It is foreseen that the studies of gastro-intestinal malabsorption and kidney function will be completed in 1979. A symposium on medical radionuclide imaging will be proposed for 1980. It is probable that investigation of techniques appropriate to other diagnostic studies, selected in part on the basis of results from the first component, will be initiated in 1980.

Co-operation with other organizations

E.32. This component will be carried out with the advice and co-operation of WHO and ICSH.

Activation analysis of elements of biological significance

Objective

E.33. The main objective is to intercompare and assist in improving nuclear activation techniques (especially, as appropriate, in research reactors) for the assay of trace elements of biomedical significance, and, in collaboration with WHO, to guide their application to the solution of health problems distinctively associated with local environments.

In particular, the association between tissue trace element concentration and cardiovascular disease will be explored (during the period 1969-77), the trace element concentration in human milk will be measured (1976-80), and the association between tissue trace element concentration and neurological or mental disorders will be explored (1977-81).

Results to date

E.34. This component was established in 1965. A total of ten research contracts and agreements have been awarded. Since 1971 the main focus of these investigations has been an IAEA/WHO joint research programme on trace elements in cardiovascular diseases to study the possible association of specific elements in the food chain and in human tissues with the incidence of isohaemic heart disease and arterial hypertension in various environments. Three meetings of investigators were held in 1971, 1973 and 1974 respectively, and the reports of these meetings have been published. Support by the Laboratory has been provided on numerous methodological problems. The results obtained to date are suggestive of some interesting associations between trace elements and cardiovascular diseases, but do not yet permit final conclusions to be drawn. Methodological problems have been identified, the solution of which will also have important implications for other types of trace element investigations. Other projects have yielded results for trace elements in relation to cystic fibrosis and goitre. Support has been given to the International Agency for Research on Cancer in a project involving the use of activation analysis in studies of the role of arsenic in certain types of experimental carcinogenesis. A panel on in-vivo activation analysis, and a symposium on nuclear activation techniques in the life sciences organized in collaboration with other Sections, were held in 1972.

Plans for 1977-78

E.35. It is anticipated that the IAEA/WHO joint research programme on trace elements in cardiovascular diseases will reach its conclusion early in this two-year period (Table E.8, No. 5). A new IAEA/WHO joint research programme on trace elements in human milk, initiated in 1975, will be brought to a peak (Table E.8, No. 7) and a further IAEA/WHO joint research programme on trace elements in neurological and mental disorders is expected to start. All of these programmes will be guided by outside expert advice and will receive support from the Agency's Laboratory. A systematic comparative study of methods of trace element analysis in the life sciences will be made and a manual on the subject will be published. Proposals for future programmes will be developed, possibly including occupational health and investigations with stable isotope tracers.

Related activities

E.36. Close co-ordination will be maintained with other Sections that have an interest in activation analysis, and advice and assistance will be provided where appropriate. Continued support for the Analytical Quality Control Services programme of the Seibersdorf Laboratory will be provided. A review of progress in nuclear activation techniques in the life sciences will be arranged in 1978 (Symposium - Annex III (4)).

Plans for 1979-82

E.37. It is expected that the IAEA/WHO joint research programme on trace elements in human milk will be concluded in 1980 and the programme on neurological and mental disorders in 1981. Work in other areas, such as occupational health and stable isotope studies, and on other diseases such as malnutrition and cancer, could then be intensified.

Co-operation with other organizations

E.38. Close collaboration will be maintained with WHO, particularly in regard to those investigations which have already been formally established as joint IAEA/WHO programmes. The co-sponsorship of WHO and FAO will also be sought in connection with the proposed manual on comparative methods of trace element analysis.

Dosimetry for intentional radiation applications

OBJECTIVE

E.39. The objective is to advise Member States on the application of techniques for dosimetry of ionizing radiations, and to provide assistance, guidance and recommendations for improving dosimetric accuracy.

PLANS FOR 1977-82

E.40. The joint IAEA/WHO project concerning the establishment of an international network of Secondary Standards Dosimetry Laboratories (SSDLs) will become the central component of this sub-programme, WHO having the main responsibility for the secretariat of the network and the Agency extending its scientific and technical support. Closely related to it is another project which is concerned with comparisons of radiation dose measurements for X-rays, cobalt-60 gamma radiation, high-energy photons and electrons, and for mixed gamma/neutron radiations in research reactors. It is envisaged that parts of these dose comparisons be eventually taken over by national or regional SSDLs.

E.41. Research will be supported and co-ordinated in selected laboratories aimed at improving the accuracy and precision of dosimetry techniques in radiotherapy, radiology, and for industrial and environmental applications.

STRUCTURE

E.42. This sub-programme consists of three components, which are described in the following paragraphs.

Dosimetry for intentional radiation applications

Summary by programme components

Table E.5

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Network of Secondary Standards Dosimetry Laboratories (SSDLs)	1.5	1.5	87 500	-	28 000	3 900	119 400
Dose comparison services	1.5	1.5	87 200	25 000	-	2 600	114 800
Dose comparison development	1.3	1.3	73 900	6 000	23 000	1 900	104 800
Linguistic, printing and publishing services	-	-	-	-	-	47 000	47 000
Data processing services	-	-	-	-	-	4 000	4 000
Laboratory services	-	-	-	-	-	15 000	15 000
TOTAL	4.3	4.3	248 600	31 000	51 000	74 400	405 000

Network of Secondary Standards Dosimetry Laboratories

Objective

E.43. The objective is to assist Member States, in collaboration with WHO, in the setting up of SSDLs, to organize dose comparisons between them and provide technical advice, and to link these laboratories via the SSDL network to the primary metrology system.

Results to date

E.44. This component was initiated in 1968. So far, nine SSDLs have been designated in Argentina, Brazil, India, Iran, Mexico, Nigeria, Romania, Singapore and Thailand. Laboratories in Bulgaria, Chile, Indonesia, Israel, the Philippines and Turkey have been assisted and supported in their development to become national/regional SSDLs. One SSDL (in Brazil) has already organized a national dose comparison service by mail, in co-operation with the Agency's Dosimetry Laboratory.

Plans for 1977-78

E.45. It is envisaged that by 1978 a total of 15-20 SSDLs will be in existence. Revised guidelines regarding instrumentation and working procedures for the setting up of SSDLs in the IAEA/WHO network will be elaborated in 1977 jointly with WHO and the International Organization for Legal Metrology; a training seminar on the task and function of national and regional Secondary Standards Dosimetry Laboratories will be organized in 1978 at which information on experience gained will be exchanged. It is envisaged that by 1978 there will be three SSDLs conducting local dose comparison services as a result of the Agency's guidance and support. A calibration manual for SSDLs will be published in 1978.

Related activities

E.46. Related activities involve the technical evaluation of technical assistance projects and technical or research contracts for organization of local dose comparisons, the organization of a training course for SSDL staff and laboratory activities such as the training of SSDL staff in the Agency's Dosimetry Laboratory.

Plans for 1979-82

E.47. It is envisaged that an additional number of laboratories will apply for membership in the network. After completion of the criteria, the organizational work under the component will be substantially reduced. Particular efforts will be undertaken to make the network self-sustaining.

Co-operation with other organizations

E.48. This component is a joint IAEA/WHO project. Close co-operation with the International Organization for Legal Metrology and a number of leading national standards laboratories has been established.

Dose comparison services

Objective

E.49. The objective is to conduct jointly with WHO dose comparison services aimed at improving the accuracy and reliability of dose measurements in radiotherapy and to organize and participate in dose comparisons in other fields of radiation applications.

Results to date

E.50. This component was initiated in 1968. About 800 dose comparisons (involving about 400 radiotherapy institutes from 70 Member States) have been carried out for cobalt-60, high energy electrons and photons since 1970. In 1975 about 10% of the institutes showed deviations of more than $\pm$ 10%. Most institutes with inaccurate dosimetry showed considerable improvement in their results when checked in a second comparison.

E.51. A calibration set-up has been built for X-ray dosimetry, and trial comparisons of a thermoluminescence dosimetry system for X-ray comparisons were successfully carried out in 1975.

E.52. The Dosimetry Laboratory participated in the European Neutron Dosimetry Intercomparison Programme at the GSF in Neuherberg, Munich, Federal Republic of Germany in 1975.

Plans for 1977-78

E.53. Work under this component includes the following subjects:

(a) Cobalt-60 postal dose comparisons (about 150 comparisons per year). It is expected that a considerable additional number of comparisons will be carried out by regional or local Secondary Standards Dosimetry Laboratories;

(b) X-ray dose comparisons. It is expected that about 150-200 institutes per year, most of them in developing countries, will benefit from this work;

(c) High-energy electrons and photons. Work on this subject will be continued on special request at an expected rate of 30 comparisons per year; and

(d) An international review of dosimetric quantities required to be standardized and of the instruments effecting such standardization will be made in 1977 (Symposium - Annex I (5)). The Agency's work on dose comparisons and standardization will be discussed and evaluated in 1978 by an advisory group.

Related activities

E.54. The related activities involve the laboratory services.

Plans for 1979-82

E.55. It is expected that a considerable part of the cobalt-60 comparison service will have been taken over by the Secondary Standards Dosimetry Laboratories and that the X-ray comparison service will constitute the main part of the component.

Co-operation with other organizations

E.56. This component is a joint IAEA/WHO project. Close co-operation with about ten leading national standards laboratories has been established for regular calibrations of the Agency's secondary dosimetry standards.

Dose comparisons development

Objective

E.57. The objective is to develop and test within the Dosimetry Laboratory dosimetry instrumentation and procedures suitable for the IAEA/WHO postal dose comparison

services (proposed duration 1968-80) and to test and improve instrumentation to be used for dose comparisons for mixed gamma/fast neutron radiations of neutron generators and in research reactors (1975-82).

Results to date

E. 58. A suitable thermoluminescence dosimetry system for X-ray comparisons has been developed in the Dosimetry Laboratory.

Plans for 1977-78

E. 59. In order to increase the reliability of the evaluation procedure and to reduce the workload for the laboratory staff some automation will be gradually introduced. It is planned to make available upon request the results of the European Neutron Dosimetry Intercomparison Programme to non-participating institutes by conducting mixed-field dosimetry comparisons. A review will be made in 1977 on the development of dosimeters suitable for in-pile dose comparisons (Technical Committee - Annex II (7)). Research in this field will be supported (Co-ordinated research programme, Table E. 8, Nos 9 and 10).

Plans for 1979-82

E. 60. It is expected that support in most fields in which support is currently provided will continue through 1982. From 1979 onwards, support of research on special dosimetric problems related to the development of fusion test reactors might become necessary. However, support in certain aspects of research related to dose intercomparisons may be gradually phased out as it is expected that standard methods will become available.

Co-operation with other organizations

E. 61. Co-operation with about ten national standards laboratories and especially with the GSF has been established.

Radiation biology

OBJECTIVE

E. 62. The objective is to advise and assist Member States, in particular the developing countries, in the utilization of radiobiological information for improving disease control, radiotherapeutic and diagnostic practices and the quality of medical supplies, for assessing hazards from environmental pollutants and for treating domestic and industrial wastes.

PLANS FOR 1977-82

E. 63. Work will continue to aim at the establishment of a sound scientific basis for the practical applications of radiobiological effects in radiation sterilization of medical products, radiation attenuation of parasites and other infective agents for preparation of vaccines against human diseases, improvement of radiation therapy of cancer and diagnostic radiology, protection of the environment against pollutants and improvement of biosphere resources. Increasing emphasis will be placed on radiobiological studies needed to evaluate the relative hazards of ionizing radiation associated with the use of nuclear energy in comparison with the hazards from other important chemical pollutants released in the human environment from common industrial installations.

E. 64. The Agency's work on radiation sterilization of medical products will be directed to meet the needs of Member States in Asia, Africa, and the Far East with their problems of certain microbial contaminants. The work to improve radiotherapy and radiological diagnosis will include the use of Auger emitters in radiotherapy of cancer in addition to the

sensitization of malignant cells and the protection of normal tissues by chemical and physical agents. The environmental radiation biology programme will be focused on the protection of man and his environment with particular reference to biological implications of the radioactive isotopes released from nuclear industries as compared with other major chemical pollutants.

STRUCTURE

E.65. This sub-programme consists of five components, which are described in the following paragraphs.

Radiation biology

Summary by programme components

Table E. 6

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Radiation sterilization of medical products and biological tissues	0.7	0.2	37 100	-	23 000	1 000	61 100
Radiation attenuation of infective agents for the preparation of vaccines	0.6	0.2	33 400	-	10 000	1 000	44 400
Modification of cellular radiosensitivity	1.0	0.7	52 800	12 000	40 000	2 000	106 800
Radiosensitivity of pathogens in wastes	0.6	0.2	32 900	9 000	12 000	1 400	55 300
Comparative biological hazards of low-level radiation and other major environmental pollutants	1.4	1.0	74 000	24 000	40 000	2 400	140 400
Linguistic, printing and publishing services	-	-	-	-	-	77 000	77 000
TOTAL	4.3	2.3	230 200	45 000	125 000	84 800	485 000

Radiation sterilization of medical products and biological tissues

Objective

E.66. The objective is to determine the minimum radiation dose requirements for safe sterilization of biomedical materials with reference to specific product criteria and the microbial contaminants of relevance to countries in Asia, Africa and the Far East (during the period 1977-82) and to determine the antigenic alterations of radiation-sterilized tissue grafts and other biological preparations affecting their safe clinical uses (1977-79).

Results to date

E.67. Practical applications of radiation have been furthered for the sterilization of ready-to-use hermetically sealed medical supplies such as sutures and implants, pharmaceutical basic materials and medicaments. To a limited extent bones and nerve tissues have been sterilized for use in transplant surgery. Progress made was reviewed by an advisory group. In view of the installation in India of a radiation facility for the commercial-scale sterilization of medical supplies and the construction of such facilities in Hungary and the Republic of Korea, the relevant research to meet their specific needs has been supported and co-ordinated. Recommendations on the practices and regulations

of radiation sterilization of medical products, elaborated by working groups of international experts, have been published; this document has been used by many Member States in their national regulations governing sterilization procedures and control of sterility. Biological monitoring systems using vegetative and spore-forming bacteria have been developed and made available for calibration and study for the facilities in Australia, Czechoslovakia, Greece, India and the Republic of Korea. Recent progress made in the subject was reviewed in a symposium in 1974 and the proceedings were published. Two research co-ordination meetings and a training course for Member States in Latin America have been organized. A Manual on Radiation Sterilization of Medical and Biological Materials has been published.

Plans for 1977-78

E.68. Emphasis will be placed on the radiation-induced alterations in the antigenic properties of biological tissues for replacement surgery and other clinical uses. A co-ordinated research programme is planned for the radiation control of microbial contaminants of relevance to the interested Member States in Asia, Africa and the Far East.

Related activities

E.69. It is proposed, subject to the availability of funds, to convene a regional training course in 1977 and a training seminar in 1978 on the use of radiation sterilization of medical products. Advisory missions to developing Member States are foreseen.

Plans for 1979-82

E.70. Work on the radiosterilization of medical products as a regional project will be continued to meet the need for the accumulation and dissemination of relevant technical information for the countries of the region concerned. A regional project on the antigenic properties of irradiated tissue grafts will be initiated, bearing in mind the needs of Member States. Subject to the availability of funds, regional training courses and seminars on radiation sterilization of medical and biological products will be organized to meet the demands of the countries in Asia, Africa and the Far East.

Co-operation with other organizations

E.71. Close co-operation is maintained with WHO in the development and standardization of radiation sterilization practices.

Radiation attenuation of infective agents for the preparation of vaccines

Objective

E.72. The objective is to explore the possibility of using nuclear techniques in the preparation of vaccines against human protozoal parasitic diseases such as malaria (during the period 1977-1980).

Results to date

E.73. On an expert's advice, a co-ordinated research programme was established in 1973 to study the use of radiation for attenuation of human protozoal parasites, such as plasmodia and trypanosoma, for the production of vaccines against these organisms. This programme was soon expanded to include such helminthic diseases as filariasis and schistosomiasis. The programme has been carried out in conjunction with the animal parasitology programme of the Joint FAO/IAEA Division and in close collaboration with WHO. It has involved 12 research contracts and agreements with institutes in developing and developed Member States. The progress made was reviewed at two research co-ordination meetings and by an advisory group. During the Fourth International Congress of Parasitology, the Agency and WHO co-sponsored an informal panel discussion on this subject.

Plans for 1977-78

E.74. The co-ordinated research contract programme directed against human parasites (Table E.8, No. 12) will be phased out. A new co-ordinated research programme will be initiated directed specifically at those protozoal diseases which present the greatest promise of control by immunological techniques, for example, malaria.

Plans for 1979-82

E.75. The progress under this component will be reviewed in 1980.

Co-operation with other organizations

E.76. This component involves co-operation and consultation with WHO.

Modification of cellular radiosensitivity

Objective

E.77. The objective is to collect and review new findings on modifiers of radiosensitivity for improving radiotherapy of cancer and radiological diagnosis (during the period 1975-82), to explore the possibility of utilizing radioisotopes producing Auger electrons for radiotherapy of cancer, and to encourage the use of these techniques (1976-82).

Results to date

E.78. From the review of consultants and a panel of experts it became apparent that the application of neutrons for cancer therapy has serious limitations, particularly in developing countries, on account of the high cost of neutron sources and the difficulties encountered in achieving accurate spectrometry and dosimetry. On the other hand, modification of radiosensitivity by chemical and physical agents can be carried out with relatively modest facilities. Therefore, a co-ordinated research programme related to this subject has been initiated (Table E.8, No. 13) and the significant contributions made by developed and developing countries have been reviewed by an advisory group. (In addition, the recent results and radiobiological concepts with particular reference to radiotherapy of cancer will be critically discussed and disseminated at the Symposium on Radiological Research Necessary for Improvement of Radiotherapy of Cancer this year.)

Plans for 1977-78

E.79. During this period the main emphasis will be placed on chemicals that sensitize hypoxic cells in the tumour without influencing the sensitivity of normal cells and chemicals which protect the normal tissues surrounding the tumour region. The collection, evaluation and dissemination of information on chemical radiosensitizers and protectors that are readily available, clinically acceptable and differentially active in cancer radiotherapy will be carried out (Advisory Group - Annex II (8)). Clinical trials of one or more radiosensitizers will be encouraged through a research co-ordination programme initiated in 1975 (Table E.8, No. 13). Research on the use of Auger emitters will be encouraged and supported. The late biological consequences of diagnostic, therapeutic and other exposures will be reviewed in 1978 (Symposium - Annex III (3)).

Plans for 1979-82

E.80. Research for the improvement of radiotherapy of cancer will be supported and co-ordinated. It is expected that the scope of the component will be enlarged and more emphasis will be laid on chemical modifiers of radiosensitivity which protect against damaging effects of radiation. The high efficacy of Auger emitters in cell-killing will

also be explored for application in radiotherapy of cancer. In addition, efforts will be made to collect information on radiobiological implications of diagnostic radiological procedures, particularly those utilizing contrast media.

Co-operation with other organizations

E.81. This component involves co-operation with WHO in the organization of scientific meetings and development of co-ordinated research.

Radiosensitivity of pathogens in wastes

Objective

E.82. The objective is to collect and review data on relative sensitivity of pathogenic organisms for effective application of ionizing radiation in sewage treatment (during the period 1976-78).

Results to date

E.83. The use of ionizing radiation has been envisaged as a means of solving some of the problems in treating municipal and industrial wastes. The disinfection of sludges and the modification of their physical properties is an area, among others, where radiation offers some promise. Experiences in a pilot plant in the Federal Republic of Germany on radiation treatment of sewage sludge provided sufficient data to warrant this application. Since most of the conventional sewage treatment methods fail to sterilize all pathogens of public health importance, radiation alone or in combination with chemico-physical agents could be sufficiently effective in this regard. However, on review, the data on the radiosensitivity of micro-organisms in sewage were found scanty. A co-ordinated research programme was, therefore, initiated on the radiosensitivity of pathogenic organisms of public health importance to provide standard reference data for Member States introducing radiation treatment of wastes.

Plans for 1977-78

E.84. The co-ordinated research programme on the radiosensitivity of pathogenic organisms will be terminated upon the publication of the compiled data. After critical evaluation (Technical Committee - Annex II (9)) research on the radiation treatment of sewage in combination with other chemical and physical agents may be supported.

Related activities

E.85. A study tour for on-site evaluation of the application of radiation in sewage treatment will be planned if sufficient progress has been made by Member States at the level of pilot-plant operations.

Plans for 1979-82

E.86. An advisory group meeting is foreseen for 1979 to review the question of technical and economic feasibility, and the work to be done will then be decided.

Co-operation with other organizations

E.87. This component involves co-operation and consultation with WHO, FAO and UNEP.

Comparative biological hazards of low-level radiation and other major environmental pollutants

Objective

E.88. The objective is to collect, assess and disseminate information on the effects of selected chemical pollutants and of the radiation involved in medical and industrial applications, on the suitability of chromosomes as test systems for extrapolation of radiation effects at low doses, on the incorporation of tritium and its biological effects, and on the biological implications of other nuclides released from nuclear installations.

Results to date

E.89. The work in question has evolved as a new programme component from the earlier component entitled "Environmental radiation biology" with a view to concentrating the Agency's efforts in more restricted fields of relevance to future nuclear industries. Whereas the nuclear power programmes of Member States continue to increase steadily, public concern over biological hazards from the associated radiation has increased even faster. In this component it is intended to collect and disseminate information on the comparative hazards of pollutants from nuclear and non-nuclear industries. New methods and criteria for evaluation of biological effects of radiation at low doses and for extrapolation of such results from experimental animals to human systems were discussed in a symposium in 1975. A co-ordinated research programme has been initiated to assess the suitability of the chromosome as a test system for this purpose (Table E.8, No. 14).

Plans for 1977-78

E.90. The suitability of chromosomes for estimating biological hazards will be evaluated (Table E.8, No. 14). For the evaluation of their comparative hazards, research on biological effects of major pollutants including radiations will be supported through a new co-ordinated research programme and the available information will be reviewed (Advisory Group - Annex II (10)) and disseminated. Biological implications and consequences of radionuclides released during the application of nuclear technologies will be discussed. In order to assist in introducing radiobiological methods for environment hazard evaluation a seminar is planned for the African region (Seminar - Annex I (6)).

Plans for 1979-82

E.91. Working groups will be formed for various chemical pollutants in order to evaluate and recommend rem-equivalent-chemical doses. A co-ordinated research programme will be initiated to study the effects of tritium and other nuclides keeping in view the future nuclear developments.

Co-operation with other organizations

E.92. A close collaboration with WHO and UNEP is foreseen for the activities in this component.

Health-related environmental research

OBJECTIVE

E.93. The objective is to co-ordinate and stimulate national activities on applications of nuclear methods for assessing contamination of man and his environment and to compile and disseminate the relevant data concerning the pollution burden imposed on man by nuclear and conventional industries.

PLANS FOR 1977-82

E.94. Activities will aim at contributing to studies on non-radioactive contaminants of man, in particular in relation to his radioactive contamination, by using nuclear methods.

E.95. Having started with neutron activation analysis of human hair, the work will be extended to other tissues, exreta and the immediate environment of man as well as to other nuclear methods.

E.96. As data on concentrations of contaminants are compiled and a scientific basis for comparing hazardous effects of radioactive and non-radioactive pollutants is worked out at the Radiation Biology Section, an attempt will be made to compare the relative ratios of man's body burdens of pollutants coming from nuclear and conventional industries.

STRUCTURE

E.97. This sub-programme consists of two components, which are described in the following paragraphs.

Health-related environmental research

Summary by programme components

Table E.7

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Nuclear methods in environmental research	2.0	0.7	71 900	-	15 000	2 000	88 900
Comparative body burdens of radioactive and non-radioactive pollutants	1.2	0.5	45 100	-	8 000	1 000	54 100
Linguistic, printing and publishing services	-	-	-	-	-	10 000	10 000
Data processing services	-	-	-	-	-	6 000	6 000
TOTAL	3.2	1.2	117 000	-	23 000	19 000	159 000

Nuclear methods in environmental research

Objective

E.98. The objective is to stimulate the development of nuclear methods, especially activation analysis, for determining the chemical composition of human hair and other human tissues as an indicator of environmental pollution of man.

Results to date

E.99. Although this component has been initiated this year, the first co-ordinated research programme on the subject (Table E.8, No. 15) was initiated in 1975. Sufficient information has been collected to show that the chemical composition of human hair as determined by nuclear and other methods reflects man's body burden of some inorganic pollutants, especially mercury and cadmium. A variety of analytical techniques is being used in Member States and an attempt has been undertaken to evaluate some of them in terms of sensitivity, reliability and simplicity. The instrumental neutron activation analysis has definite advantages; however, the radiochemical procedures seem unavoidable in many cases. The activity is being carried out as a co-ordinated research programme and 14 Member States have agreed to participate in it.

Plans for 1977-78

E.100. A technical report will be published on the results of neutron activation analysis of hair as an indicator of man's contamination. A new co-ordinated research programme

on the determination of pollutants in human hair using photonuclear, fast neutron activation analysis and X-ray fluorescence analysis will be initiated. Thereby the number of elements determined will be increased, and intercomparison studies using different nuclear methods, including thermal neutron activation analysis, will be carried out. A review of different activation techniques for analysis of hair and other human tissues will be made by an advisory group in 1978.

Related activities

E.101. The related activities will be carried out by the Agency's Laboratory.

Plans for 1979-82

E.102. Work will be extended to other tissues of the human body, as well as to excreta, food and drinking water. Other nuclear methods, including those for molecular analysis, will be used.

Co-operation with other organizations

E.103. Co-operation will be sought with WHO, UNESCO (Man and Biosphere Programme) and UNEP.

Comparative body burdens of radioactive and non-radioactive pollutants

Objective

E.104. The objective is to collect, assess and disseminate data on the comparative burdens of radioactive and non-radioactive pollutants for the population with the purpose of predicting environmental quality as a function of the development of nuclear power and technology.

Results to date

E.105. This component, which is a new one, is justified in that an unbiased assessment of the impact of nuclear energy on the environment is possible only in comparison with other sources of pollution. Unfortunately, up to now the information about possible hazardous consequences of the contamination of man by non-radioactive pollutants is much less definite than in the case of radioactive contaminants.

Plans for 1977-78

E.106. An effort will be made to use the dose commitment concept for conventional industries, mainly for fossil sources of energy. This concept may be a basis for comparing consequences of pollution coming from nuclear and conventional industries. The work will be carried out in close collaboration with the Radiation Biology Section, which will aim at establishing dose-effect relationships and elaborating relevant fundamental biological concepts; this component will, however, be confined to the collection and evaluation of factual data in regard to specified industries. Special attention will be paid to the population of different geographical areas in developed and developing countries.

Plans for 1979-82

E.107. Equivalent dose commitments of nuclear and non-nuclear industries will be compared. The information will be distributed among Member States to make possible a more objective assessment of relative hazards from nuclear and conventional industries.

Co-operation with other organizations

E.108. Co-operation with WHO, UNESCO (Man and Biosphere Programme) and the Scientific Committee on Problems of the Environment is foreseen.

Co-ordinated research programmes

Table E. 8

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. In vitro assay techniques	10	1	1971	1978
2. In vitro procedures, such as radioimmuno- and radio-receptor assays, in reproductive physiology	4	2	1974	1979
3. Joint IAEA/WHO programme on iron nutrition	5	1	1969	1976
4. Use of computers for the intercomparison of scintigraphic techniques	1	19	1971	1976
5. Medical applications of activation analysis	4	5	1972	1977
6. Use of antigens labelled with radioisotopes in serological epidemiology	3	-	1969	1976
7. Comparative methods for the study of trace elements in human nutrition	2	-	1975	1980
8. Computer applications in clinical dosimetry	2	2	1971	1976
9. Development of a transfer instrument for neutron dosimetry intercomparison	1	6	1974	1978
10. Reactor in-pile chemical dosimeter intercomparison and standardization	2	-	1975	1980
11. Radiation sterilization of biomedical materials and biological tissues	6	2	1969	1976
12. Use of nuclear techniques in the preparation of vaccines against parasitic diseases	3	4	1973	1978
13. Improvement in radiotherapy of cancer using modifiers of radiosensitivity of cells	5	2	1975	1980
14. Radiation-induced chromosomal aberrations for genetic risk evaluation in man	7	3	1975	1980
15. Neutron activation analysis of pollutants in human hair using research reactors	2	-	1975	1978

F. PHYSICAL SCIENCES

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table F.1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	773 918	810 000	84 000	12 000	96 000	906 000	1 029 000
Consultants	26 753	44 000	1 000	47 000	48 000	92 000	140 000
Temporary assistance	5 939	1 000	100	11 400	11 500	12 500	18 500
Sub-total	806 610	855 000	85 100	70 400	155 500	1 010 500	1 187 500
Common staff costs	231 520	235 800	32 200	4 400	36 600	272 400	310 000
Travel	39 206	42 000	2 000	1 000	3 000	45 000	54 000
Meetings							
Conferences, symposia seminars	20 697	116 000	4 000	(4 000)	-	116 000	70 000
Technical committees, advisory groups	50 389	83 000	5 000	19 000	24 000	107 000	136 000
Representation and hospitality	1 507	7 200	700	400	1 100	8 300	8 000
Scientific and technical contracts	188 625	189 000	9 000	20 000	29 000	218 000	265 000
Scientific supplies and equipment	1 396	24 000	1 000	2 000	3 000	27 000	30 000
Common services, supplies and equipment	8 000	-	-	800	800	800	500
Transfer of costs:							
Linguistic services	68 615	72 000	8 000	(6 000)	2 000	74 000	80 000
Printing and publishing services	310 232	322 000	22 000	(39 000)	(17 000)	305 000	290 000
Data processing services	53 375	100 000	8 000	(35 000)	(27 000)	73 000	77 000
Laboratory services	1 046 044	1 118 000	96 700	141 300	238 000	1 356 000	1 474 000
TOTAL	2 826 216	3 164 000	273 700 8,7%	175 300 5,5%	449 000 14,2%	3 613 000	3 982 000

SUMMARY OF MANPOWER

Table F.2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	5	5	5	1	6	6
P-4	10	10	10	-	10	10
P-3	5	5	5	-	5	5
P-2	2	2	2	-	2	2
P-1	1	1	1	-	1	1
Sub-total	24	24	24	1	25	25
GS	16	16	16	1	17	17
TOTAL	40	40	40	2	42	42

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 $449 000 in 1977, of which $273 700 will be required to cover salary and other price increases and $175 300 is a programme increase.

F.2. The programme increase of $16 400 in respect of salaries for established posts and common staff costs is the net result of the addition of one Professional post for the "Physics" sub-programme and one GS post for the "Nuclear data" sub-programme on the one hand and delays in recruitment for vacant posts on the other. In the "Nuclear data" sub-programme the activities of the new "Atomic and molecular data" component will be carried out with the help of consultants. A programme increase of $47 000 is foreseen for such services. Additional GS support will be provided by temporary assistance for which an increase of $11 400 is foreseen. Additional travel funds ($1000) will be required for the "Isotope hydrology" sub-programme.

F.3. There will be a programme reduction of $4000 in respect of conferences, symposia and seminars. Although four meetings are planned for 1977, the same number as was included in the 1976 estimates, the financial requirements will be lower since no interpretation will be provided for seminars in 1977. The programme increase of $19 000 in respect of technical committees and advisory groups reflects an increase in the number of meetings from nine in the 1976 budget to 10 in the estimates for 1977. A small increase in hospitality funds will be required in respect of the additional meeting.

F.4. The "Nuclear data" sub-programme will require an amount of $20 000 in respect of a research co-ordination programme for the measurement and evaluation of needed decay data for transactinium nuclides. Since no funds had previously been provided, this represents a programme increase. The increase of $2000 for scientific supplies and equipment reflects increased requirements for nuclear targets which are supplied to developing countries on request.

F.5. For 1977 an amount of $800 will have to be provided for common services, supplies and equipment for which no provision was made in the 1976 budget; this amount will be needed for a drafting table for the "Isotope hydrology" sub-programme.

F.6. As regards transfers of costs, it is foreseen that there will be programme reductions in respect of linguistic services ($6000), printing and publishing services ($39 000) and data processing services ($35 000), but an increase in respect of laboratory services ($141 300). The latter is due mainly to the distribution in 1977 of the construction cost of the annex to the laboratory (see part G).

F.7. It is expected that the income from the sale of CINDA publications which are published under the "Nuclear data" sub-programme will be $35 000 in 1977.

Manpower

F.8. As will be seen from Table F.2 above, the addition of one Professional post and one GS post is foreseen for 1977.

F.9. One additional P-4 staff member will be required for the "Physics" sub-programme, in particular for the "Utilization of research reactors" component to advise on assistance to reactor centres in developing countries in their research programmes, organize meetings on the subject, offer technical guidance on research contracts and advise on the Agency's technical assistance in that regard.

F.10. In the "Neutron nuclear data" component of the "Nuclear data" sub-programme a GS post will be required for a staff member to assist in the compilation of neutron and related nuclear data.

F.11. Following the recommendation of an internal review group on the work and manpower of the "Nuclear data" sub-programme, the up-grading of one P-4 post to the P-5 level is foreseen for 1977.

THE PROGRAMME

OBJECTIVE

F.12. The objective is to stimulate research, to foster information and data exchange and to co-ordinate the efforts of scientists from different countries in physics, industrial applications of isotopes, chemistry, nuclear data and isotope hydrology. Special attention will be paid to the needs of developing countries in regard to water and raw material resources and to education and training in nuclear science and techniques.

STRUCTURE

F.13. This programme consists of four sub-programmes which are dealt with separately below.

Summary of manpower and costs by sub-programme

Table F.3

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years P	Man-years GS	Costs	Man-years P	Man-years GS	Costs
Physics	4,3	2,3	389 000	4,3	2,3	537 000
Industrial applications and chemistry	5,2	2,2	1 356 000	5,2	2,2	1 389 000
Isotope hydrology	4,2	3,2	923 000	4,2	3,2	979 000
Nuclear data	11,3	9,3	945 000	11,3	9,3	1 077 000
TOTAL	25,0	17,0	3 613 000	25,0	17,0	3 982 000

SUB-PROGRAMMES

Physics

OBJECTIVE

F.14. The objective is to provide consultative and evaluative services in applied and fundamental physics. It involves activities in the field of information exchange (meetings, publications, etc.) and, where appropriate, the preparation of reviews and position papers for special international programmes. The activities relating to theoretical physics are carried out by the International Centre for Theoretical Physics (see part H).

PLANS FOR 1977-82

F.15. Activities will be concentrated on aspects of nuclear physics of particular interest to developing countries, for example the use of low-energy accelerators and neutron generators and applications of X-ray and Mössbauer spectroscopy. The efficient use of research reactors will be promoted on a regional basis by providing advice, organizing training and co-ordinating research programmes in selected fields such as neutron diffraction and inelastic scattering and neutron radiography. Work will continue in plasma physics and fusion research, including the provision of assistance to leaders of national fusion programmes in co-ordinating their efforts by exchanging information through the International Fusion Research Council (IFRC). Laboratories in countries other than those engaged in major fusion research projects will be advised on the conduct of significant research in those areas which are recommended by advisory groups. Conferences, regional seminars, technical committees and advisory groups are being planned for these years.

STRUCTURE

F.16. This sub-programme consists of three components, which are described in the following paragraphs.

Physics

Summary by programme components

Table F.4

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Nuclear physics	1,1	0,6	51 800	15 000	12 000	6 900	85 700
Utilization of research reactors	2,0	1,0	88 000	13 000	17 000	3 700	121 700
Plasma physics and controlled fusion research	1,2	0,7	55 000	18 000	46 000	2 600	121 600
Linguistic, printing and publishing services	-	-	-	-	-	60 000	60 000
TOTAL	4,3	2,3	194 800	46 000	75 000	73 200	389 000

Nuclear physics

Objective

F.17. The objective is to review the status of selected areas of research and to advise on, encourage and co-ordinate work in developing countries with particular emphasis on: fission studies (1964-78), utilization of low-energy accelerators and neutron generators (1967-79), Mössbauer spectroscopy (1972-82), X-ray spectroscopy (1972-81), and mini- and micro-computers in nuclear science (1974-80).

Results to date

F.18. The symposia on the physics and chemistry of fission, which have tended to concentrate on the theory of the fission process itself, are recognized as the main international meetings of their kind, the last having been held in 1973. Research contracts have contributed to the understanding of fission as, for example, those on the studies of some aspects of ternary fission.

F.19. The utilization of low-energy accelerators and neutron generators is of considerable interest to many countries and the Physics Section has convened regional seminars and panels on those subjects. It has been brought to the attention of nuclear physicists that useful basic and applied work can be done with relatively modest modern detectors and accelerators by well-trained experimentalists. Several accelerator laboratories have modified their programmes and shifted their activities towards more applied studies. Many research contracts have been completed in this field of physics. The first co-ordinated research programme initiated by the Physics Section is devoted to trace analysis by charged-particle-induced X-ray fluorescence, and the technique has demonstrated high sensitivity and precision in multi-element quantitative analysis and is finding applications in many fields, including biology, medicine and environmental studies (Table F.8, No. 1).

F.20. Several small meetings have been organized on various aspects of nuclear techniques, in particular Mössbauer spectroscopy. A number of projects have been initiated through the technical assistance programme. With individual research contracts, work relating to fast neutron activation analysis and X-ray fluorescence for analytical purposes, for example, has been stimulated.

Plans for 1977-78

F.21. Recent advances in isomeric fission and its importance in gaining an understanding of the fission mechanism will be reviewed in 1978.

F.22. A regional seminar on the utilization of low-energy accelerators for South East Asia is planned for 1978. A critical review will be made in 1978 of the needs for medium flux neutron generators, the optimum design of their construction and their applications to medicine, chemistry and solid state physics (Advisory Group). A co-ordinated research programme on this subject will be initiated in 1977 and is expected to continue through 1979.

F.23. The use of Mössbauer spectroscopy in the study of magnetic materials will be the subject of a co-ordinated research programme starting in 1977, including applications in metallurgy, mineralogy and solid state physics. In 1977 consultants will analyse the potential of heavy-ion-induced X-ray fluorescence and advise on future activities. The programme on mini-computers will be expanded to include the emerging generation of micro-computers; implementation will be mainly through technical assistance projects and individual consultations. Assistance will be provided for programmes in the utilization of established nuclear techniques, until now mainly used in nuclear structure studies, to deal with practical problems important to national economies. In 1977 the efforts will concentrate on Latin and Central American countries (Advisory Group - Annex II (12)).

Plans for 1979-82

F.24. There will be a strong emphasis on those subjects which are of interest to developing countries, such as the advanced uses of low-energy accelerators through the programme of technical assistance and research contracts, the application of nuclear techniques in applied research and the introduction of electronic systems based on the new generation of small computers. Academic research will be represented by heavy-ion-induced X-ray fluorescence and it is predicted that by 1979 this technique will contribute greatly to the present methods of X-ray fluorescence.

Co-operation with other organizations

F.25. Except in the case of fission studies, the work will involve a high degree of co-operation with the Division of Technical Assistance and the Contracts Administration Section.

Utilization of research reactors

Objective

F.26. The objective is to promote the efficient use of research reactors in developing countries by advising on and organizing training and co-ordinated research in selected fields, such as neutron diffraction and inelastic scattering (1962-82) and neutron radiography (1975-80).

Results to date

F.27. Regional meetings devoted to the general problem of research reactor utilization have been held almost every year; they have included topics such as isotope production, neutron activation analysis, nuclear, neutron and solid state physics, and reactor operation (safety and maintenance). The series of six Agency symposia on neutron inelastic scattering have played an important role in improving the quality of solid state studies by the use of neutrons. Numerous laboratories in developing countries now produce excellent results in this type of research, which has been introduced at every research reactor. A co-ordinated research programme has been in progress and is directed towards defining the techniques and research subjects which are advisable for developing countries. The recent interest in neutron radiography and texture studies with neutrons has been demonstrated by consultants' meetings.

Plans for 1977-78

F.28. Progress in the instrumentation for and application of neutron inelastic scattering will be the subject of extensive studies (Table F.8, No. 2) emphasizing the value of these techniques in applied research (Symposium - Annex I (7)). A new co-ordinated research programme will start in 1978 and will concentrate in the routine use of neutron diffractometers and spectrometers and continue through 1982. The technique of neutron radiography and its further development in reactor laboratories in developing countries will be stimulated (co-ordinated research programme). An additional Professional staff member at the P-4 level will be needed for this activity.

Related activities

F.29. The programme includes advisory services on the construction of new research reactors and adjoining laboratories which are being planned on a national basis or with UNDP support.

Plans for 1979-82

F.30. The organization of regional seminars on selected subjects of research reactor utilization will continue and will be subject to careful analysis in view of the impact on the

programmes of interested countries. Investigations applying neutron elastic and inelastic scattering will continue to be a considerable part of the programme through 1982.

Plasma physics and controlled fusion research

Objective

F.31. The objective is to assist leaders of national fusion programmes in the co-ordination of research by exchanging information through the work of IFRC and the Joint NEA/IAEA International Liaison Group on Thermionic Electrical Power Generation, and to use the existing facilities and expertise in developing countries to contribute to the international fusion programme.

Results to date

F.32. The Physics Section assisted with the establishment, in 1970, of IFRC and has provided the scientific secretariat for its meetings. Based on IFRC's advice, the Agency initiated studies on fusion power and the environment, the publication of the "World Survey of Major Facilities in Controlled Fusion Research" (1973) and the collation and dissemination of atomic and molecular data for fusion. The Physics Section has regularly held major international conferences on plasma physics and controlled fusion; the latest took place in Tokyo, Japan, in 1974. These conferences are now to be organized every two years. Several specialists' meetings in fusion have been organized in co-operation with other Divisions of the Agency. Research in developing countries on energetic particle interactions with materials of importance to fusion reactors will be co-ordinated (Table F.8, No. 3). A consultants' meeting has defined the objectives and priorities for this programme.

F.33. The Joint NEA/IAEA International Liaison Group on Thermionic Electrical Power Generation made a review of the status of national programmes in thermionics. The Agency co-sponsored the Third International Conference on Thermionic Electrical Power Generation in 1972 and other specialists' conferences.

Plans for 1977-78

F.34. IFRC will update in 1977 its status report on controlled fusion research prepared in 1970 (Technical Committee - Annex II (14)). The regular major conference on plasma physics and controlled fusion research will be organized in 1978 (Conference - Annex III (5)). The development of energetic high current injectors for fusion reactors will be examined in 1977 (Advisory Group - Annex II (13)). The co-ordinated research programme on plasma wall interactions of importance to fusion reactors will continue until 1979 with a number of developing countries becoming involved (Table F.8, No. 3).

Plans for 1979-82

F.35. It is expected that the international activity in controlled fusion research will continue to expand and that the Agency's activities will correspondingly increase. The Agency may be able to assist in initiating a large-scale international fusion reactor project and should continue to provide small countries with up-to-date information on research relating to fusion power generation. In addition to the IFRC meetings and the regular conferences on plasma physics and controlled fusion research, the Physics Section will organize, together with other Divisions of the Agency, conferences and technical meetings on various problems which become important as power from fusion reactors comes closer to reality. Co-ordinated research programmes will continue to use the expertise and facilities of developing countries for the fusion research effort.

F.36. Thermionic energy conversion might gain additional momentum due to some technical breakthrough, and the Physics Section will be ready to increase its activity in this field.

Co-operation with other organizations

F.37. The Agency will continue to co-ordinate its activities with OECD and the newly formed International Energy Agency through IFRC, some of whose members represent these organizations, and through the Joint NEA/IAEA International Group on Thermionic Electrical Power Generation.

Industrial applications and chemistry

OBJECTIVE

F.38. The objective is to serve the Member States in developing nuclear-based techniques for materials testing and composition analysis in process and product control, for the exploitation of natural resources and for industrial safety, to stimulate effective utilization of radioactive, activable and stable isotopes and accelerators in science and industry, and to resolve problems related to the chemistry of isotope production and the preparation of isotopically labelled compounds, radiopharmaceuticals and nuclear materials.

PLANS FOR 1977-82

F.39. The activities will be concentrated on those of importance to scientific and technological progress in the next decades. These activities are primarily concerned with the use of neutron activation analysis, X-ray fluorescence spectrometry and prompt gamma ray techniques in the exploitation of mineral and fossil fuel resources; evaluation of the use of X-ray and neutron techniques for industrial process control and in non-destructive testing; development of technological innovations in radiation processing; optimization of isotope production and preparation of labelled compounds; evaluation of nuclear materials by physico-chemical techniques and the use of nuclear physical techniques for the investigations of chemical changes and mass transfer phenomena.

STRUCTURE

F.40. This sub-programme consists of three components, which are described in the following paragraphs.

Industrial applications and chemistry

Summary by programme components

Table F.5

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Materials testing and analysis	2,5	1,0	125 400	27 000	35 000	4 500	191 900
Production and industrial use of radioactive sources	1,1	0,6	59 500	42 000	36 000	5 200	142 700
Chemistry	1,6	0,6	79 000	3 000	-	3 400	85 400
Linguistic, printing and publishing services	-	-	-	-	-	95 000	95 000
Laboratory services	-	-	-	-	-	841 000	841 000
TOTAL	5,2	2,2	263 900	72 000	71 000	949 100	1 356 000

Materials testing and analysis

Objective

F.41. The objective is to review the status of selected areas of research; to advise on, encourage and co-ordinate work in developing countries with particular emphasis on: nuclear-based techniques for composition analysis for process and product control, the exploitation of natural resources and industrial safety, neutron activation analysis with decay and prompt gamma ray techniques for mineral prospecting and exploration for oil and coal, on-line X-ray and neutron techniques for industrial process control of minerals and ores, and nuclear techniques for non-destructive testing of materials.

Results to date

F.42. A panel on practical aspects of activation analysis was convened in 1973 to orient the multi-discipline approach in materials analysis. In co-operation with the Seibersdorf Laboratory, a consultants' meeting was held in 1973 to discuss analytical quality control and reference materials. A panel on nuclear techniques in geochemistry and geophysics was held in 1974 to review the recent status of mineral prospecting. A symposium on the use of nuclear techniques in the analysis of environmental pollutants is being held this year.

F.43. A symposium in 1972 reviewed the development of X-ray and neutron techniques for process control in basic metal industries. Technical assistance programmes have been implemented to encourage the use of nucleonic instruments in industrial process control.

F.44. A training course was organized in 1971 to disseminate the information available on the use of radiography in materials testing. A consultants' meeting on neutron radiography was held in 1975. Research projects and technical assistance activities have been carried out to encourage the use of non-destructive testing methods in developing countries. An advisory group is being convened this year to review the technological development in materials testing.

Plans for 1977-78

F.45. A review of the progress in the use of nuclear techniques in the exploitation of mineral and fossil fuel resources will be made in 1977 (Symposium - Annex I (8)). Practical aspects of energy dispersive X-ray fluorescence analysis will be reviewed in 1978. Research will be co-ordinated on the development of nuclear analytical techniques (Table F.8, No. 4).

F.46. A co-ordinated research programme for on-line X-ray and neutron techniques for industrial process control will be initiated in 1977. Research related to cost-benefit analysis for on-line control will be initiated. For the economic processing of low-grade ores and recycling of materials, on-line control with radioisotope sensors and mini-computers will be supported through technical assistance and research contracts.

F.47. Research activities on data processing of radiographs, crystalline structures in alloy surface cracks, and neutron radiography will be carried out. A training course is planned to introduce recent developments in radiography for heavy machinery, tankers and high-speed engines.

Plans for 1979-82

F.48. Increasing emphasis will be given to the analysis of trace elements and organic compounds as well as to nuclear-based analytical techniques for in situ prospecting of mineral deposits. More work on neutron activation analysis with decay and prompt gamma-ray techniques will be envisaged for mineral exploitation work. Meetings and research contracts will be sponsored to encourage the use of nuclear techniques in organic analysis.

F.49. Intercomparison study of nuclear-based on-line control techniques with non-nuclear methods will be made. Assessment of the role of nuclear techniques in individual industrial operations will be evaluated through case studies.

F.50. The organization of industrial radiography services will be promoted in countries undergoing industrialization. Applications of neutron radiography will be linked to the utilization of research reactors.

Co-operation with other organizations

F.51. This component may involve co-operation with UNIDO, ECODOC's Committee on Natural Resources and other United Nations and governmental organizations.

Production and industrial use of radioactive sources

Objective

F.52. The objective is to review the status of research and development in the case of radioactive and radiation sources, in particular cobalt-60 irradiation facilities for industrial radiation processing (1973-77), radioisotope production technology using nuclear reactors and accelerators (1976-80), the preparation of stable isotopes (1976-82), and to assist in feasibility studies on the application of industrial electron beam for irradiation of commercial products (1974-78).

Results to date

F.53. During the last six years symposia, regional seminars, advisory groups and consultants' meetings have been organized for the dissemination of information. Technical assistance to developing countries has been provided to support the production of a number of radioisotopes with a view to achieving national self-sufficiency. Symposia and panel meetings have been held to review the progress in radiation technology. Five UNDP large-scale projects have been implemented in developing countries to demonstrate radio-sterilization and electron beam processing. Tracer technology was discussed in two symposia on environmental studies and other meetings on industrial applications of radio-isotopes. Biological applications of stable isotopes are being reviewed at a symposium this year. Training courses and technical assistance projects were carried out to assist in the use of tracer techniques in industry.

Plans for 1977-78

F.54. New trends in the technology of the production of selected radioisotopes most extensively used in medicine and industry will be examined in 1977 (Advisory Group - Annex II (15)). The status of the separation of radioactive isotopes from nuclear wastes will be reviewed in 1977 (consultants). The experience and programmes relating to the utilization of nuclear centres in Latin America will be reviewed in 1977 (Regional Seminar - Annex I (9)). Research will be supported in the technical innovations of special interest in waste recovery, desalination and modification of polymers. Technical assistance activities and research contracts will be continued to meet the needs of developing countries.

Plans for 1979-82

F.55. The production of isotopes will be supported with particular emphasis on the use of cyclotrons and the separations of fission products for the high specific activity radio-isotopes. The work will be done through scientific meetings, training courses and co-ordinated research programmes. Activities will be centred on the development of special techniques such as ion implantation, catalysis and the use of semi-conductor materials for energy conversion devices. Extension of the studies to specific subjects such as electronics, bio-engineering and metallurgy will be planned. Cost-benefit studies on the use of tracers in process dynamics will be supported through research contracts.

Co-operation with other organizations

F.56. This component involves co-operation with both national and international organizations.

Chemistry

Objective

F.57. The objective is to co-ordinate research on the preparation of labelled compounds of biological interest and on the chemistry of these compounds; to review and evaluate rapid methods for the biological control of short-lived radiopharmaceuticals and exchange and disseminate information on results obtained; to advise on the use of nuclear physical techniques in specific fields of chemistry and to review, compile and publish chemical thermodynamic data of actinide elements.

Results to date

F.58. During the last six years symposia, training courses, advisory groups, research co-ordination and consultants' meetings have been organized, some of them in co-operation with WHO. Two co-ordinated research programmes have been completed. Technical advisory missions have been undertaken by the staff. A panel on the thermodynamics of uranium-plutonium carbide systems and a symposium on the thermodynamics of nuclear materials were held in 1974. International compilation work was undertaken to produce a critical assessment entitled "The Thermodynamics of Actinide Elements and Compounds" which will be published in eleven separate volumes, and advisory groups were convened during 1974-75 to complete work on the manuscript.

Plans for 1977-78

F.59. A review of the new developments in radiopharmaceuticals and labelled compounds will be made in 1977 (consultants). Research will be co-ordinated on improving production using accelerators (Table F.8, No. 7). Evaluation, with the assistance of international experts, relating to the chemistry of nuclear materials technology will be continued. The chemical standards prepared by several well-known laboratories will be distributed for intercomparison studies and the subject will be reviewed (Advisory Group - Annex II (16)). The application of nuclear physical techniques in chemistry will be discussed at a consultants' meeting with a view of recommending the guidelines for future activities. The compilation work on thermodynamic data will be completed in 1977, and additional work will be done on gaseous actinide ions.

Plans for 1979-82

F.60. Scientific meetings, co-ordinated research programmes, training courses and technical reports will continue to play an important role in the dissemination of information on the preparation and chemistry of labelled compounds, reactor chemistry, and the chemical aspect of nuclear materials. A review of the status of the thermodynamics of nuclear materials will be made during this period. Research support will be concluded in the field of chemistry of labelled compounds, and technical advice on chemistry problems will be provided to developing Member States.

Co-operation with other organizations

F.61. This component involves co-operation with various national bodies and with organizations such as EURATOM, the Institute of High Temperatures (Soviet Union) and the International Council of Scientific Unions (Committee on Data for Science and Technology).

Isotope hydrology

OBJECTIVE

F.62. The objective is to encourage the use and development of isotope techniques in hydrological investigations to serve Member States wishing to establish or increase their own capability in the use of these methods and to collect and disseminate basic data and information.

PLANS FOR 1977-82

F.63. The use of isotope techniques in hydrology will continue in the developing countries through sub-contractual services in support of UNDP large-scale water development projects, and by the execution of demonstration projects at the request of Member States. Attempts will also be made to foster bilateral agreements between newly-established groups and those having longer experience. Post-graduate training courses in hydrology, sponsored by UNESCO, will be supported by the provision of lecturers on isotope hydrology. Specialized techniques will be selected for assessment of their potential use in the developing countries and also to identify the areas where research and development are required.

STRUCTURE

F.64. This sub-programme consists of three components, which are described in the following paragraphs.

Isotope hydrology

Summary by programme components

Table F.6

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Precipitation	0,6	1,2	32 000	-	-	1 500	33 500
Surface water	1,1	1,0	60 000	11 000	20 000	4 500	95 500
Groundwater	2,5	1,0	129 000	-	32 000	8 000	169 000
Linguistic, printing and publishing services	-	-	-	-	-	100 000	100 000
Data processing services	-	-	-	-	-	10 000	10 000
Laboratory services	-	-	-	-	-	515 000	515 000
TOTAL	4,2	3,2	221 000	11 000	52 000	639 000	923 000

Precipitation

Objective

F.65. The objective is to collect every month precipitation samples from a world-wide network of stations, to measure tritium, deuterium and oxygen-18, and to publish the data which are essential for applications in hydrological investigations.

Results to date

F.66. The stable isotope composition (^{18}O and deuterium) and tritium concentrations of precipitation samples collected monthly from a global network of 144 stations are regularly measured. Results of these measurements together with relevant meteorological data were published in three additional volumes which are supplementary to the earlier volumes. More recent data are available from the Agency on request until the subsequent volumes are published. Particular studies on precipitation and on snow accumulation have been supported through research contracts in Chile and in Iceland.

Plans for 1977-78

F.67. Detailed statistical evaluation of available data made in 1975 and being made this year which aims at determining the most suitable number of stations with a view to continuing this project at a limited number of key stations is foreseen. The sixth volume of data is planned for publication in 1977.

Related activities

F.68. An assessment of the potential use of the isotope data collected so far is to be undertaken in co-operation with WMO. The Isotope Hydrology Laboratory will perform the isotopic measurements for this activity.

Plans for 1979-82

F.69. Data from the reduced world network of precipitation stations will be accumulated and assessed.

Co-operation with other organizations

F.70. This component involves co-operation with WMO.

Surface water

Objective

F.71. The objective is to apply isotope techniques in surface water investigations.

Results to date

F.72. The water balance and dynamics of lakes have been studied by using isotopic techniques in Chad, Kenya and Turkey. Interrelations between surface water and groundwater have been investigated in Algeria, Czechoslovakia, Greece, Italy, Mexico, Senegal, Sudan and Chad. The evolution of tritium content has been monitored in some of the major rivers of the world.

F.73. The use of radioisotopes, particularly for sediment transport studies in rivers and estuaries, has proved to be feasible and has produced good results. Technical assistance in this field has been provided to several Member States both in terms of expertise and equipment.

Plans for 1977-78

F.74. A review of the progress made in the use of both environmental and artificial isotope techniques in surface water hydrology will be made in 1978 (Symposium - Annex III (6)). A knowledge of the dynamics of lakes is useful with respect to problems of pollution and fishery development. For this purpose the use of variations in the environmental isotopic composition of lake waters will be assessed (Advisory Group - Annex II (17)) after which a co-ordinated research programme on selected lakes may be initiated.

F.75. A review of some aspects of a co-operative programme within the programme of the International Hydrological Decade, in which the Agency collaborated with UNESCO in the measurement of the run-off of tritium in some of the major rivers of the world, will be completed in 1977.

F.76. Advice and assistance will continue to be given on the use of nuclear techniques to deal with specific problems relating to surface water and sediment transport posed by Member States. In some cases this will be followed by on-site demonstration at the request of Member States.

Plans for 1979-82

F.77. It is expected that the possible study of the dynamics of some lakes referred to above will be completed during this period. A review of recent advances in radioisotope techniques for dealing with sediment transport problems is foreseen. An assessment of the value of isotope techniques in studies of the dispersion of pollutants in surface waters will be made.

Co-operation with other organizations

F.78. It is envisaged that the work under this component will be done in collaboration with FAO, WHO, UNEP and UNESCO.

Groundwater

Objective

F.79. The objective is to provide services to Member States using environmental isotope techniques in solving various hydrological problems arising in groundwater inventory, and to assist Member States in establishing their own capability (this activity started in 1961); to evaluate potential applications of single-well isotope techniques to solve groundwater problems in developing countries (1976-78); and to review and evaluate applications of isotope techniques in hydrological aspects of specialized topics: geothermal prospecting (1975-78) and groundwater pollution (1976-79).

Results to date

F.80. Environmental isotopes are now widely used to elucidate the behaviour of water in aquifers by determining the age of groundwater and tracing its movement. These techniques often provide unique conclusions on the age or origin of water not available by any other means. During the period under review, field projects have been completed in Afghanistan, Algeria, Austria, Chad, Greece, Jamaica, Lebanon, Mexico, Morocco, Nicaragua, Senegal, Spain, Sudan, Surinam, Togo, Tunisia and Turkey.

F.81. Research contracts have been completed on groundwater studies in Algeria, Cyprus, Egypt, Senegal and Turkey. The current status of applications of these techniques was reviewed in a symposium in 1974.

Plans for 1977-78

F.82. The programme covering sub-contractual services in UNDP large-scale projects and demonstration field studies in Member States will continue. Consultants will be sent to developing countries to assist in field investigations and in establishing laboratory facilities. Specific techniques, such as single-well methods, will be evaluated for their potential use under the conditions encountered in developing countries (research contracts and agreements).

F.83. Emphasis will be placed on the application of environmental isotope techniques, and allied methods such as hydrochemistry, to deal with groundwater problems in arid regions. An advisory group to be convened in 1978 will review the work in this field,

assess and catalogue the applied techniques and determine the most promising areas for continued research. Rapid advances and new applications are expected in the use of environmental isotopes in the study of fluid dynamics in geothermal areas. An advisory group will be convened in 1978 to review the state of the art and to provide guidance for related activities of the Agency. Close co-operation with UNESCO will be maintained in carrying out the activities of the International Hydrological Programme working group on the application of nuclear techniques and instruments in the study of surface and subsurface water. The Agency will provide the technical secretariat for the second session of the working group expected to meet in 1977 (Working Group - Annex II (18)). The subject of this session will be formulated on the basis of research priorities established at the first session held this year.

Related activities

F.84. Training in analytical techniques and in the application and interpretation of data with respect to hydrological problems will be provided to participants from developing Member States through fellowships and "on the job" training at the Agency's Headquarters and selected institutions.

F.85. Under the research contract programme, the potential use of ^{39}Ar, ^{85}Kr, and other noble gases is being investigated.

F.86. At present, assistance is being given in the establishment of environmental isotope laboratory facilities (e.g. in Greece and Pakistan), and this type of help is expected to continue.

Plans for 1979-82

F.87. The programme is expected to continue along the same general lines. In addition, efforts will be made to encourage the development of new methods in the use of isotope data to measure hydraulic parameters, evaluate the potential use of additional environmental isotopes in groundwater investigations, develop field and laboratory methods for their collection and analysis, and develop nuclear techniques for use in groundwater pollution studies. A review of the progress made in the use of isotope techniques in groundwater hydrology is foreseen for 1979.

Co-operation with other organizations

F.88. This component involves co-operation with FAO, WHO, UNESCO, UNEP and the United Nations.

Nuclear data

OBJECTIVE

F.89. The objective is to promote the world-wide exchange, evaluation and dissemination of nuclear and atomic data; to offer data centre services to developing countries; to assess nuclear and atomic data requirements, and to co-operate with national programmes of nuclear and atomic data for peaceful applications. The Agency's International Nuclear Data Committee assists in co-ordinating and reviewing these activities.

PLANS FOR 1977-82

F.90. In addition to the continuous collection and dissemination of neutron data and the associated data centre service offered to developing countries, further efforts will be devoted to improving the quality and scope of data centre services, and to achieving an unrestricted international exchange of evaluated neutron data. Primarily through scientific meetings and in co-operation with the International Nuclear Data Committee (Annex II (19))

and the International Fusion Research Council, nuclear and atomic data needs in energy and non-energy programmes will be assessed and will continue to determine the priorities of the Agency's nuclear data programme.

F.91. In the area of non-neutron nuclear data, where the primary aim is to co-ordinate the international compilation and exchange of isotopic nuclear property data, it is intended to promote the establishment of an international evaluated nuclear structure and decay data file with free access to all Member States. With regard to atomic and molecular data, the effort will initially be oriented primarily towards the needs expressed by the fusion community, and ultimately towards those identified in other disciplines. The Agency plans to co-sponsor the Fifth Conference on Nuclear Cross-Sections and Technology to be held in the United States in 1979.

CO-OPERATION WITH OTHER ORGANIZATIONS

F.92. The programme involves close co-operation with the following major regional nuclear data centres: United States National Neutron Cross Section Center, United States Nuclear Data Project, OECD(NEA) Neutron Data Compilation Centre, and Soviet nuclear data centres in Obninsk, Moscow and Leningrad. It also involves co-operation with the NEA Nuclear Data Committee, the Central Bureau for Nuclear Measurements (Bureau Central de Mesures Nucleaires) of the Commission of the European Communities and the International Council of Scientific Unions (Committee on Data for Science and Technology).

STRUCTURE

F.93. The three components formerly comprising this sub-programme have been redefined so as to reflect more adequately the data areas which form the scope of the data centre activities. The former programme component entitled "Data review and measurement" is in fact applicable to all three components, including the new component on atomic and molecular data, and has been distributed among them. The three components now making up the sub-programme are described in the following paragraphs.

Nuclear data

Summary by programme components

Table F.7

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Neutron nuclear data	8,3	5,2	368 400	79 000	-	34 400	481 800
Non-neutron nuclear data (Nuclear structure and decay data, charged particle and photonuclear data)	2,1	2,0	99 200	15 000	20 000	3 700	137 900
Atomic and molecular data	0,9	2,1	135 600	-	-	2 700	138 300
Linguistic, printing and publishing services	-	-	-	-	-	124 000	124 000
Data processing services	-	-	-	-	-	63 000	63 000
TOTAL	11,3	9,3	603 200	94 000	20 000	227 800	945 000

Neutron nuclear data

Objective

F.94. The objective is to compile, exchange and disseminate experimental and evaluated neutron nuclear data, making them available upon request to Member States; to co-ordinate the activities of regional data centres; to review the requirements for nuclear data of major importance in nuclear technology and to support and co-ordinate experimental and theoretical research on such data.

Results to date

F.95. One function of this component has been the annual publication, since 1970, of CINDA, the comprehensive index to all measured, calculated and evaluated neutron data; the last issue, CINDA 75, contains more than 108 000 reference entries.

F.96. Since 1970, results of neutron data measurements have been systematically exchanged between the Nuclear Data Section and three regional neutron data centres by means of the computer-based EXFOR system. Computer programmes for the storage, checking, retrieval and editing of neutron nuclear data have been developed and provided upon request to other data centres.

F.97. The continuously growing demand for evaluated neutron data, of vital importance to the development of the nuclear reactor technology, has led to a gradual increase in the free international exchange of these data. With the recent release of the United States ENDF/B-IV fission product and dosimetry data files the Nuclear Data Section now holds 22 files of evaluated neutron data, available to all Member States.

F.98. Scientific meetings have been held with the aim of identifying the nuclear data requirements of specific branches of nuclear technology (Advisory Group Meeting on Fission Product Nuclear Data in 1973, and Advisory Group Meeting on Transactinium Isotope Nuclear Data in 1975). The results of such meetings, together with the national input to the World Request List for Nuclear Data Measurements (WRENDA, a yearly publication of the Section) and recommendations by the International Nuclear Data Committee, have formed the basis for the promotion and co-ordination of specific nuclear data measurements and evaluations and for the justification to supply target and sample materials for such measurements in developing countries.

Plans for 1977-78

F.99. The provision of nuclear data services to Member States, consisting of the dissemination of numerical nuclear data (i.e. magnetic tapes), is expected to increase in order to satisfy the growing requirements of nuclear science and technology. Co-ordination between the regional neutron data centres will continue to be achieved through annual meetings of the representatives of these centres. It is expected that the neutron data compilation workload will remain at the same level. Progress in the measurement, calculation and evaluation of fission product data (Advisory Group - Annex II (20)) and actinide nuclear data will be reviewed in 1977 since both types of data are of vital importance to nuclear waste management and environmental safety. A research co-ordination programme for the evaluation of neutron nuclear data of transactinium isotopes is being initiated this year. As a result of the meeting on Nuclear Theory in Neutron Nuclear Data Evaluation held at the Trieste Centre in 1975, further developments and improvements in nuclear theory for the calculation of data needed for fission and fusion reactor design are to be presented and analysed during a six-week seminar in 1977 (Annex I (10)).

Plans for 1979-82

F.100. While it is expected that requirements for fission reactor technology will begin to be gradually satisfied, it is foreseen that neutron data for fusion reactors and non-energy

applications will grow in importance, with increasing emphasis being put on their accuracies.

Non-neutron nuclear data (nuclear structure and decay data, charged particle, and photo-nuclear data)

Objective

F.101. The objective is to review the requirements for nuclear data of importance in applications of radiations and isotopes, and to co-ordinate internationally the compilation, evaluation and dissemination of such data.

Results to date

F.102. This component was initiated in 1970. The International Working Group for Nuclear Structure and Reaction Data, convened by the Agency in 1972, and the Agency's Symposium on Applications of Nuclear Data in Science and Technology, held in 1973, established a first broad picture of nuclear data user requirements in a variety of applications and of current national compilation and evaluation activities. In order to satisfy these needs, the convening of meetings of "non-neutron" nuclear data compilers started in 1974 with the aim of developing co-operation between the centres in compiling, evaluating, exchanging and disseminating these data and developing an international computerized file of evaluated nuclear structure and decay data. The Nuclear Data Section has also established a central information office to serve as a world-wide referral centre for non-neutron nuclear data information.

Plans for 1977-78

F.103. International agreement between leading centres to exchange charged particle and photonuclear reaction data on a systematic basis is expected to be achieved. Co-ordinating meetings of representatives of these nuclear data centres will be convened on a regular basis. The Section will continue to assist in co-ordination of the compilation, evaluation and dissemination of nuclear reaction and radioactive decay data. The co-ordination of an international network to compile, evaluate and disseminate nuclear structure and decay data is expected to continue (Advisory Group - Annex II (21)). Requirements for isotopic nuclear techniques in science and technology will be reviewed in 1978 (Advisory Group). A research co-ordination programme for the measurement and evaluation of needed decay data of transactinium nuclides is planned to be started in 1976 and will continue in 1977 and 1978.

Plans for 1979-82

F.104. The assessment of non-neutron nuclear data needs in co-operation with the International Nuclear Data Committee will continue as well as the international co-ordination of compilation, evaluation and dissemination of these data. A growing need for more reliable data can be foreseen and a simultaneous increase in the data services to be provided is to be expected.

Atomic and molecular data

Objective

F.105. The objective is to review the requirements for and co-ordinate the compilation, evaluation and dissemination of atomic and molecular data of importance to thermonuclear fusion research and technology.

Results to date

F.106. This component was initiated in 1975. Its scope (atomic and molecular data for fusion), which has been recommended by the Agency's International Fusion Research Council,

will be oriented towards meeting the important needs expressed by the fusion community. At present, data on injection systems, surface interactions, impurity effects and plasma diagnostics are needed. It is envisaged that bibliographic information and numerical atomic and selected molecular data will be compiled and disseminated, in co-operation with national and regional data centres. An advisory group meeting is being held this year in order to assess the needs, evaluate the status, and establish the priorities for atomic and molecular data required for thermonuclear fusion research and technology.

Plans for 1977-78

F.107. After an initial organizational phase during the current year, work under this component will be carried out for a trial period of two years, i.e. 1977-1978. During this period, the programme will be continuously reviewed by the International Nuclear Data Committee and the International Fusion Research Council.

F.108. During the initial period, this component will have the following aims:

(a) Identification of the most critical needs for atomic and molecular data for fusion;

(b) Co-ordination of compilation work to avoid duplication of effort;

(c) Formulation of standardized computer input and output format for the storage and retrieval of bibliographic and numerical atomic and molecular data;

(d) Establishment of an international system of data dissemination; and

(e) Development of guidelines for the publication of atomic and molecular data.

F.109. A second advisory group meeting to assess new needs for atomic and molecular data in the continuously growing field of fusion research and technology is planned for 1978.

Plans for 1979-82

F.110. This component, provided that its continuation is recommended, will have the following long-term objectives:

(a) To act as a central library for bibliographic and numerical data collected from data centres specialized in atomic and molecular structure and collisions and in surface and vacuum physics;

(b) To develop universal criteria for evaluating atomic and molecular data;

(c) To provide coverage of the world's report and conference literature, and make bibliographical and numerical data available to specialized data centres; and

(d) To initiate and support critical reviews by arranging for specialists throughout the world to write such reviews under contract.

Co-ordinated research programmes

Table F. 8

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. Elemental analysis by charged-particle-induced X-rays	5	3	1974	1978
2. Application of research reactor neutron scattering techniques in the study of solids	8	-	1973	1978
3. Energetic particle interactions with materials of importance to fusion reactors	This programme has been approved but no contract has yet been awarded			
4. Nuclear-based techniques in geology and mineral prospecting	1	3	1972	1977
5. Nuclear-based methods for trace-elements analysis	4	2	1971	1976
6. Rapid methods for the quality control of radiopharmaceuticals	1	3	1972	1977
7. Production of radiopharmaceuticals from accelerator-produced isotopes	This programme has been approved but no contract has yet been awarded			

G. THE LABORATORY

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table G. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	1 438 210	1 689 000	85 000	(4 000)	81 000	1 770 000	1 875 000
Overtime	2 374	4 000	300	200	500	4 500	4 700
Temporary assistance	464	1 000	100	(100)	-	1 000	1 100
Sub-total	1 441 048	1 694 000	85 400	(3 900)	81 500	1 775 500	1 880 800
Common staff costs	429 776	491 500	41 000	(1 500)	39 500	531 000	562 200
Travel	5 025	4 500	300	5 200	5 500	10 000	10 000
Scientific and technical contracts	9 708	15 000	1 000	(500)	500	15 500	16 000
Scientific supplies and equipment	238 386	226 000	22 000	(4 000)	18 000	244 000	285 000
Common services, supplies and equipment	219 042	294 000	81 000	250 000[a/]	331 000[a/]	625 000[a/]	660 000[a/]
Other items of expenditure	1 017	-	-	1 000	1 000	1 000	1 000
Transfer of costs:							
Linguistic services	5 568	-	-	8 000	8 000	8 000	9 000
Printing and publishing services	16 255	2 000	-	13 000	13 000	15 000	16 000
Data processing services	28 685	5 000	1 000	22 000	23 000	28 000	30 000
Laboratory services	(2 394 510)	(2 732 000)	(231 700)	(289 300)	(521 000)	(3 253 000)	(3 470 000)
TOTAL	-	-	-	-	-	-	-

a/ Includes $200 000 for 1977 and $150 000 for 1978 in respect of the extension of new annex at Seibersdorf.

SUMMARY OF MANPOWER

Table G. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
P-5	5	5	4	1	5	5
P-4	13	14	14	(1)	13	13
P-3	5	5	5	-	5	7
P-2	5	5	5	-	5	3
P-1	2	2	2	-	2	2
Sub-total	30	31	30	-	30	30
GS	55	59	59	1	60	60
M&O	22	24	24	-	24	27
TOTAL	107	114	113	1	114	117

CHANGES IN COSTS AND MANPOWER

Costs

G. 1. As will be seen from Table G. 1 above, the cost of laboratory services is apportioned to the programmes for which they are provided. The total cost of laboratory services is expected to increase by $521 000 in 1977, of which $231 700 will be required to cover salary and other price increases and $289 300 represents a programme increase.

G. 2. There is a programme reduction of $5500 in respect of salaries for established posts and common staff costs after taking account of the additional manpower requirement for 1977 and the transfer of a P-4 post to another programme in the adjusted manning table for 1976.

G. 3. A programme increase foreseen in respect of travel for the Safeguards Analytical Laboratory ($5200) is almost offset by a programme reduction in respect of scientific supplies and equipment ($4000). The increase of $1000 foreseen in respect of "Other items of expenditure" is related to training of laboratory staff.

G. 4. Of the programme increase of $250 000 in respect of common services, supplies and equipment, an amount of $200 000 represents construction costs for the extension of the laboratory.

G. 5. Programme increases are foreseen in respect of linguistic services ($8000), printing and publishing services ($13 000) and data processing services ($22 000).

Manpower

G. 6. As will be seen from Table G. 2, the up-grading of one P-4 post to the P-5 level will be required in 1977 for the Head of the Safeguards Analytical Laboratory. The up-grading of one M&O post to the GS level for a clerk and the addition of one M&O post for a guard at the Safeguards Analytical Laboratory result in a net requirement of one additional GS post.

G. 7. For 1978 the up-grading of two Professional posts in the Safeguards Analytical Laboratory from the P-2 to the P-3 level and the addition of 3 M&O posts for the new annex to the laboratory are foreseen.

THE PROGRAMME

OBJECTIVE

G. 8. The objective of the Laboratory is to provide support for the various technical programmes, such as analytical services, calibration of radionuclides and development of techniques involved in the Agency's activities, including safeguards work.

STRUCTURE

G. 9. This programme consists of seven sub-programmes. The "Medical applications and dosimetry" sub-programme is dealt with under the respective sub-programmes of the "Life sciences" programme. After 1978 the laboratory facilities used in this sub-programme will be moved to Seibersdorf, where the Austrian authorities will provide the Agency with premises. The remaining six sub-programmes are dealt with separately below.

Summary of manpower and costs by laboratory sub-programmes

Table G. 3

Sub-programme	1977 Estimate				1978 Preliminary estimate			
	Man-years			Costs	Man-years			Costs
	P	GS	M&O		P	GS	M&O	
Metrology								
Provision of an intercomparison service for radionuclide calibrations and related matters to institutes in Member States	3.0	4.5	1.0	220 000	3.0	4.5	1,1	234 000
Assistance to Member States in the assay of neutron fluences	1.0	1.2	0.5	77 000	1.0	1.2	0.6	82 000
Provision of assistance to the Department of Safeguards and Inspection	0.1	0.3	-	11 000	0.1	0.3	0,1	14 000
Sub-total	4.1	6.0	1.5	308 000	4.1	6,0	1.8	330 000
Chemistry								
The establishment and provision of analytical quality control samples of nuclear interest to institutes in Member States	1.8	2.3	0.7	157 000	1.8	2.3	0.8	174 000
Provision of assistance in analytical chemistry to other sections of the Agency, other United Nations organizations and Member States	1.7	2.4	0.7	155 000	1.7	2.4	0.7	170 000
Provision of assistance to the agricultural section of the Laboratory in chemical matters	1.7	2.3	0.6	138 000	1.7	2.3	0.7	146 000
Sub-total	5.2	7.0	2.0	450 000	5.2	7.0	2.2	490 000
Isotope hydrology	4.2	10.0	3.0	459 000	4.2	10.0	3.4	507 000
Medical applications and dosimetry	2.1	6.0	1.0	248 000	2,1	6.0	1.2	270 000
Agriculture	8.3	10.0	10.5	737 000	8.3	10.0	12.1	801 000
Electronics and workshop services								
For the general Laboratory	1.9	7.8	1,7	276 000	1.9	7.8	1.8	305 000
For the Department of Safeguards and Inspection	0.2	2.2	0.3	60 000	0.2	2.2	0.5	69 000
Sub-total	2.1	10.0	2.0	336 000	2.1	10.0	2.3	374 000
Safeguards Analytical Laboratory	4.0	11.0	4.0	515 000	4 0	11.0	4.0	548 000
Construction								
For the general Laboratory	-	-	-	162 000	-	-	-	118 000
For safeguards needs	-	-	-	38 000	-	-	-	32 000
TOTAL	30.0	60.0	24.0	3 253 000	30.0	60.0	27.0	3 470 000

Apportionment of total laboratory costs to relevant sub-programmes

Table G. 4

Sub-programme	1977 Estimate				1978 Preliminary estimate			
	Man-years			Costs	Man-years			Costs
	P	GS	M&O		P	GS	M&O	
Food and agriculture								
Soil fertility, irrigation and crop production	2.6	2.6	3.0	261 000	2.6	2.6	3.4	270 000
Plant breeding and genetics	1.4	1.5	2.0	154 000	1.4	1.5	2.3	160 000
Insect and pest control	5.0	7.2	5.7	543 000	5.0	7.2	6.6	565 000
Sub-total	9.0	11.3	10.7	958 000	9.0	11.3	12.3	995 000
Life sciences								
Medical applications	2.3	7.2	1.5	300 000	2.3	7.2	1.7	323 000
Dosimetry for intentional radiation applications[a/]	-	-	-	15 000	-	-	-	15 000
Sub-total	2.3	7.2	1.5	315 000	2.3	7.2	1.7	338 000
Physical sciences								
Industrial applications and chemistry	10.1	15.4	4.5	841 000	10.1	15.4	5.0	914 000
Isotope hydrology	4.3	12.6	3.0	515 000	4.3	12.6	3.4	560 000
Sub-total	14.4	28.0	7.5	1 356 000	14.4	28.0	8.4	1 474 000
Safeguards	4.3	13.5	4.3	624 000	4.3	13.5	4.6	663 000
TOTAL	30.0	60.0	24.0	3 253 000[b/]	30.0	30.0	27.0	3 470 000[c/]

a/ Staff included in Life sciences programme.

b/ Including $200 000 for an extension of the new annex at Seibersdorf - $162 000 for the general laboratory, $38 000 for safeguards needs.

c/ Including $150 000 for the above extension.

SUB-PROGRAMMES

Metrology

OBJECTIVE

G. 10. The objective is to provide services to Member States and to other units of the Agency in the accurate assay of radionuclides, in nuclear spectroscopy and the assay of neutron fluences.

STRUCTURE

G. 11. This sub-programme consists of three components, which are described in the following paragraphs.

Provision of an intercomparison service for radionuclide calibrations and related matters to institutes in Member States

Objective

G. 12. The objective is to assist laboratories in Member States in radionuclide standardization and nuclear spectroscopy.

Results to date

G. 13. About 15 000 calibrated radionuclide samples were distributed up to 1971. Calibration values, measured for various radionuclides by laboratories in different Member States, were registered by Agency ionization chambers. Up-dated tables of results were sent regularly to all participants. Fifty-one calibrated samples of 16 different radionuclides were received from institutes in eight Member States in 1975. A comparison of codes for the evaluation of Ge(Li) gamma spectra has been initiated together with the Medical Applications Section.

Plans for 1977-78

G. 14. The registration of radionuclide calibrations will be continued with an enlarged scope. If justified by the outcome of the intercomparison this year of codes for evaluating Ge(Li) gamma spectra, in which about 100 institutes are participating further activities in this field will be initiated.

Assistance to Member States in the assay of neutron fluences

Objective

G. 15. The objective is to help reactor centres, especially those in developing countries, in the determination of the fluence and the spectrum of reactor neutrons.

Results to date

G. 16. Inactive activation monitors together with suitable radioactive calibration sources have been distributed. Experimental work was done for introducing ^{103m}Rh as a new monitor with a relative low energy threshold. A questionnaire was sent out in 1975 to about 200 reactor centres requesting information about their needs and currently used methods. Codes for the computation of neutron spectra from the radioactivities induced in a number of monitors have been studied.

Plans for 1977-78

G. 17. Kits, consisting of activation monitors together with the radioactive calibration sources, will be made available to interested centres (about 50 centres have already expressed their interest). The validity of three selected computer programmes for the computation of the neutron spectra from the induced activites will be tested. The results of this test, as well as codes and their documentation, will be made available to reactor centres.

G. 18. Services for straightening out discrepancies in cross-section values by eliminating differences in the calibrations by different laboratories will be offered.

Provision of assistance to the Department of Safeguards and Inspection

Objective

G. 19. The objective is to develop spectrometrical and other methods for safeguards purposes and to prepare special radioactive sources.

Results to date

G. 20. Methods were developed for the measurement of the ratio $^{239}Pu + ^{240}Pu$ to ^{238}Pu by alpha-spectrometry. It was also shown that the ratio of the plutonium isotopes can be measured, for large sources, by gamma-spectrometry. Numerous uranium and plutonium sources as well as standard sources of other gamma-emitters were prepared.

Plans for 1977-78

G. 21. The service will be continued as required. As far as spectrometric methods are concerned, efforts are expected to concentrate on non-destructive techniques for the determination of isotopic ratios in plutonium and uranium samples.

Chemistry

OBJECTIVE

G. 22. The objective is to advise and assist Member States, other units of the Agency and other United Nations organizations in chemistry, particularly in analytical chemistry.

STRUCTURE

G. 23. This sub-programme consists of three components, which are described in the following paragraphs.

The establishment and provision of analytical quality control samples of nuclear interest to institutes in Member States

Objective

G. 24. The objective is to assist laboratories in Member States to achieve, maintain and control analytical reliability by providing analytical quality control samples.

Results to date

G. 25. This component was initiated in 1964. Assistance is provided in the form of organization of intercomparisons (6 to 10 per year with 10-50 laboratories participating in each) as well as distribution of analysed reference samples and standard samples. In the period 1970-75 several thousand samples were shipped to laboratories in Member States and the status of analytical techniques in those fields of nuclear interest which are covered in this component was critically evaluated in internal reports as well as in the open literature. Materials available as standard or reference samples are used for investigations in relation to uranium prospection, nuclear and isotopic measurements, reactor technology, safeguards, waste disposal and environmental pollution, including the marine environment, biomedical, agricultural and forensic isotope work, geology and hydrology.

Plans for 1977-78

G. 26. Intercomparisons will be continued at the same rate as in previous years. Emphasis will be placed on safeguards material, on geological materials (in particular those of interest in prospection work for uranium) and on environmental pollutants. The number of reference materials available will continue to increase.

Plans for 1979-82

G. 27. A panel of experts will be convened to review this work and to suggest fields in which future intercomparisons and the provision of standard reference materials are most urgently needed.

Co-operation with other organizations

G. 28. As in the past, advice and co-operation are sought from WMO, WHO, FAO, the International Bureau of Weights and Measures, ISO and IUPAC. The Agency's Laboratory is represented in the IUPAC Commission on Physicochemical Measurements and Standards and has delegated a rapporteur (on atmospheric radioactivity measurements) to WMO's Commission on Instruments and Methods of Observation. Fruitful co-operation is also maintained with national standardization laboratories.

Provision of assistance in analytical chemistry to other Sections of the Agency, other United Nations organizations and Member States

Objective

G. 29. The objective is to provide support in chemistry and the use of nuclear-based measurement techniques to other Sections of the Agency, the Agency's experts, other United Nations organizations and Member States.

Results to date

G. 30. This component was initiated in 1962. The main work during the last few years consisted in making reference analyses of ore samples in support of uranium prospecting operations carried out under technical assistance programmes. In addition to uranium, equilibrium ratios of uranium daughters to uranium, thorium concentrations and, frequently, concentrations of accompanying metals have been determined. In the period 1970-1975 880 samples were submitted for testing from 20 Member States of the Agency. A total of 3000 determinations of individual elements was made on these samples. For hydrological purposes a method was developed for the pre-concentration of uranium present in parts per billion concentrations in natural water, prior to a determination of the $^{238}U/^{234}U$ ratio by alpha spectrometry. For geochemical rock samples containing sub-ppm concentrations of uranium, a modified and rapid fluorimetric technique was introduced. Numerous homogeneity tests were carried out on intercomparison samples prepared at the Monaco and the Seibersdorf Laboratories, using neutron activation on X-ray fluorescence analysis. Two missions were undertaken to Member States to advise on laboratory techniques and equipment.

Plans for 1977-78

G. 31. The amount of work to be carried out will depend on the demands. In view of the increasing number of uranium exploration projects supported by the Agency, the number of samples to be analysed for these projects is expected to increase. Some of these samples will be from geochemical surveys. Advisory services will continue to be provided.

Provision of assistance to the Agricultural Section of the Laboratory in chemical matters

Objective

G. 32. The objective is to provide support in chemistry to the Agricultural Section, specifically in mass- and emission spectroscopy and analytical chemistry.

Results to date

G. 33. The use of mass- and emission-spectrometric methods has been established for the routine determination of nitrogen-15 in agricultural and biological samples (about 9000 samples in 1975). For the plant breeding programmes, amino-acid analysis of hydrolyzates of protein fractions from mutant strains by means of an automatic amino-acid analyser has been carried out on a routine basis.

Plans for 1977-78

G. 34. The services will continue as required. The interest in the use of nitrogen-15 remains high.

Isotope hydrology

OBJECTIVE

G. 35. The objective is to provide analytical services in support of the Isotope Hydrology Programme and in particular for technical assistance and demonstration projects in Member States.

RESULTS TO DATE

G. 36. During the period 1970-1975, the Laboratory made 8500 deuterium, oxygen-18 and carbon-13 analyses, 7500 tritium analyses and 300 carbon-14 analyses of natural water samples from the IAEA/WMO Isotopes in Precipitation Survey and field projects in Member States. The latter projects involved participation in 21 large-scale UNDP projects and 27 demonstration projects in Member States. Programmes for intercomparison of deuterium, oxygen-18 and tritium measurements of natural water samples were initiated.

PLANS FOR 1977-78

G. 37. The main thrust of the programme will continue to be the provision of analyses of the environmental isotopic composition of natural waters. Measurement techniques will be continuously developed and automation of much of the equipment will be completed. Facilities will be installed for the chemical analysis of waters. This capability will be used where a project is not able to provide these analyses which are, in many cases, a useful and sometimes necessary addition to environmental isotope analyses.

G. 38. The Laboratory will continue to distribute isotopic water standards for deuterium and oxygen-18 and organize periodic intercomparison of measurements of environmental isotopes between laboratories in Member States. This work will also continue after the move to the Permanent Headquarters at Donaupark.

PLANS FOR 1979-82

G. 39. The work will continue along the same general lines in support of the overall programme in isotope hydrology.

Agriculture

OBJECTIVE

G. 40. The objective is to assist the Joint FAO/IAEA Division by providing analytical services, research and training, particularly in support of co-ordinated research contract programmes and technical assistance programmes.

RESULTS TO DATE

G. 41. Analytical and development services have been provided for studies of the efficient use of fertilizers, particularly nitrogen and phosphorus, for rice, wheat and legumes.

G. 42. A method for the determination of symbiotic nitrogen fixation by legume crops in the field was developed within the framework of a co-ordinated programme.

G. 43. Investigations on fertilizer nitrogen movement in soil in relation to rooting depth of maize and sugar beets were carried out under the nitrogen residue programme. Injection techniques for the study of active root development were developed and the movement of fertilizer N in the rooting zone was determined as a function of soil type and rainfall.

G. 44. The development of mass rearing methods for Mediterranean fruit flies, olive flies and tsetse flies was continued, with the main emphasis on the rearing of the tsetse fly on membranes, using animal blood as food. Thus the tsetse species Glossina morsitans is now reared without living animals as a source of blood. The artificial feeding membranes developed in the Laboratory are supplied for experimental use to Member States. Olive flies are being artificially sterilized, reared and supplied to a pilot project in Yugoslavia at a rate of 10 000-50 000 per week.

G.45. Considerable emphasis was placed on the development of analytical methods for the selection of protein mutants of wheat, barley, rice and millet as a service to the "Plant breeding and genetics" sub-programme of the Agency's "Food and agriculture" programme. Total protein as well as some amino acids are being determined in seed material by means of semi- and fully-automatic methods at a rate of 800 samples per day.

G.46. Methodological studies on the efficiency of induced mutations work for protein improvement in wheat led to the conclusion that such mutational changes occur at an appreciably lower frequency than in diploid cereal species, e.g. barley or rice.

G.47. In view of the increasing world-wide interest in grain legume improvement, investigations on the response of legume seed species to various mutagens were taken up. Suitable dose ranges have been determined for some species and were announced in the "Mutation Breeding Newsletter".

PLANS FOR 1977-78

G.48. The Laboratory will continue its support of the respective components of the "Food and agriculture" programme.

Safeguards Analytical Laboratory

OBJECTIVE

G.49. The objective is to analyse safeguards samples (uranium and plutonium) and to perform physical measurements using gamma- and alpha-spectrometry.

RESULTS TO DATE

G.50. Samples of uranium and plutonium taken by safeguards inspectors in steadily increasing numbers have been analysed for element (uranium or plutonium) and for isotopic contents. In 1975, this work began to be transferred to a new laboratory (the Safeguards Analytical Laboratory) which has been made available to the Agency by the Austrian authorities and is more suitable for handling plutonium than the old premises. The mass spectrometer, obtained in 1973, has been provided with an "on-line" computer and about 1000 samples have been analysed, approximately 600 in 1975. The Laboratory has participated in several international intercomparisons for uranium or plutonium analysis, and has organized two in collaboration with the Department of Safeguards and Inspection.

PLANS FOR 1977-78

G.51. Approximately 500-600 uranium samples and 150 plutonium and mixed uranium/plutonium samples, as well as 120 irradiated fuel samples, will be analysed annually in the Laboratory. Efforts to improve accuracy and to speed up and cheapen the analysis of samples will be continued. The two-stage mass spectrometer with pulse counting will be put into operation to obtain better data on minor isotopes. Participation in analytical inter-comparisons and quality control programmes will continue.

PLANS FOR 1979-82

G.52. Attempts to improve and speed up analytical methods will continue at the same time as the routine service for analysing samples proceeds.

Electronics and workshop services

OBJECTIVE

G. 53. To provide electronics and workshop services as required.

RESULTS TO DATE

G. 54. The mechanical workshop has designed and constructed many special types of apparatus for the scientific work of the Laboratory which are not commercially available. In the last few years, equipment for safeguards surveillance systems has been designed or adapted, often in collaboration with the Electronics Workshop, for the special purposes required. Maintenance has been provided for electronic equipment and some, which is not available commercially, has been designed and built. The latter recently included equipment providing electronic control for automatic protein analysis and computer interfacing to feed data from various equipment, like mass spectrometers, multichannel analysers, equipment for chemical analysis, etc. to computers. A substantial amount of the work now being done by the Electronics Workshop is for the Department of Safeguards and Inspection and this includes the servicing and maintenance of portable equipment and the construction of control systems for surveillance apparatus.

PLANS FOR 1977-78

G. 55. Services will be supplied as required, including the modernization of some automated equipment by using new Large Scale Integration (LSI) electronic components for command and interface units which will also simplify the pre-handling of data to be fed to conventional computers.

H. INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table H. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	267 679	258 000	33 000	-	33 000	291 000	316 000
Consultants	16 216	16 200	-	-	-	16 200	16 000
Overtime	7 127	8 000	1 000	(1 000)	-	8 000	8 000
Temporary assistance	11 193	20 000	2 000	(4 000)	(2 000)	18 000	18 000
Sub-total	302 215	302 200	36 000	(5 000)	31 000	333 200	358 000
Common staff costs	67 034	74 900	11 900	-	11 900	86 800	95 000
Travel	4 151	5 000	300	(300)	-	5 000	5 000
Meetings							
Conferences, symposia, seminars	324 715	517 000	21 000	21 000	42 000	559 000	564 000
Technical committees, advisory groups	5 838	5 500	1 000	-	1 000	6 500	6 500
Representation and hospitality	5 589	6 500	600	(600)	-	6 500	6 500
Common services, supplies and equipment	199 137	189 000	31 000	-	31 000	220 000	220 000
Other items of expenditure							
Fellowships	26 150	25 000	1 000	(16 000)	(15 000)	10 000	6 000
Visiting scientists and lecturers	123 424	112 000	4 500	33 500	38 000	150 000	143 000
Associate members	102 306	102 900	4 000	(16 900)	(12 900)	90 000	86 000
Federated institutions	33 859	33 000	1 500	(6 500)	(5 000)	28 000	25 000
Sub-total	285 739	272 900	11 000	(5 900)	5 100	278 000	260 000
Transfer of costs:							
Printing and publishing services	157 020	75 000	5 000	70 000	75 000	150 000	150 000
TOTAL	1 351 438	1 448 000	117 800 8 1%	79 200 5.5%	197 000 13.6%	1 645 000	1 665 000
Source of funds:							
Regular Budget	386 000	305 000	45 000 14,8%	250 000 81,9%	295 000 96,7%	600 000	600 000
Operating Fund 1	965 438	1 143 000	72 800	(170 800)	(98 000)	1 045 000	1 065 000
TOTAL	1 351 438	1 448 000	117 800 8.1%	79 200 5.5%	197 000 13.6%	1 645 000	1 665 000

SUMMARY OF MANPOWER

Table H. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
P-5	1	1	1	-	1	1
P-4	1	1	1	-	1	1
P-3	3	3	3	-	3	3
Sub-total	5	5	5	-	5	5
GS	17	17	17	-	17	17
TOTAL	22	22	22	-	22	22

CHANGES IN COSTS

H. 1. As will be seen from Table H. 1 above, the total cost of this programme is expected to increase by $197 000, of which $117 800 will be required to cover salary and other price increases and $79 200 represents a programme increase.

H. 2. Based on the expected availability of funds a programme increase of $21 000 is foreseen in respect of meetings, partly offset by a reduction of $5000 for overtime and temporary assistance and a reduction of $5900 in respect of "Other items of expenditure". The latter is the net result of a programme increase of $33 500 in respect of visiting scientists and lecturers, and reductions in respect of fellowships, associated members and federated institutions.

H. 3. In line with actual requirements in 1975, a programme increase of $70 000 is expected for printing and publishing services.

H. 4. The activities of the Centre were reviewed at the end of 1974 by a group of eminent physicists, appointed for this purpose by the Directors General of UNESCO and the Agency. They fully endorsed the activities of the Centre and strongly recommended that the "core" activities be more adequately funded by the three principal financial partners in order to remedy a high degree of dependence upon other, less stable sources. As a result of this recommendation, and the anticipated decrease in contributions from these latter sources, the basic contribution of the Agency has been increased to $450 000 for the year 1977. The basic contribution of UNESCO will increase to $600 000 for the period 1977-78, and the Italian Government is likewise expected to increase its contribution in 1978 from the present annual level of $350 000. In addition an amount of $150 000 to cover the printing and publishing costs apportioned to the Centre is provided.

H. 5. It is expected that the activities of the Centre will be financed in 1977 from the following sources:

Regular Budget:			
Basic contribution		450 000	
Contribution to meet printing and publishing costs		150 000	600 000
Operational Budget:			
Italian Government		350 000	
UNESCO		300 000	
SIDA		200 000	
UNDP: Solid state physics	80 000		
Mathematics	100 000	180 000	
Other		15 000	1 045 000
			1 645 000

Summary of cost by activity and major source of funds

Table H. 3

Scientific and administrative expenditures in 1977	Trieste Centre Funds	SIDA Funds	UNDP Funds	Total
Scientific staff and activities				
Scientific staff	100 000	-	-	100 000
Fellowships	10 000	-	-	10 000
Scientific visitors	150 000	-	-	150 000
Consultants	16 200	-	-	16 200
Other scientific activities				
Associates	87 000	-	-	87 000
Junior associates	3 000	-	-	3 000
Federated institutions	28 000	-	-	28 000
Seminars and workshops				
Workshop in solid state physics	15 000	-	80 000	95 000
Topical meeting (I)	10 000	-	-	10 000
Topical meeting (II)	15 000	-	-	15 000
Workshop on plasma physics	30 000	-	-	30 000
Winter college on atomic physics	50 000	50 000	-	100 000
Autumn course on geophysics or systems analysis	24 000	-	100 000	124 000
Course on the teaching of physics	-	150 000	-	150 000
Workshop in nuclear physics	20 000	-	-	20 000
Topical meeting and research sessions in astrophysics and relativity	15 000	-	-	15 000
Other scientific and technical activities				
Scientific council	6 500	-	-	6 500
Publications	150 000	-	-	150 000
Library	50 000	-	-	50 000
Duty travel	5 000	-	-	5 000
Scientific administration	190 000	-	-	190 000
Administration and overheads	290 300	-	-	290 300
TOTAL	1 265 000	200 000	180 000	1 645 000

THE PROGRAMME

OBJECTIVE

H. 6. The objective is to foster, through research and training, the advancement of theoretical physics with special regard to the needs of developing countries so as to encourage theoretical physicists from those countries to continue and expand their research work.

CO-OPERATION WITH OTHER ORGANIZATIONS

H. 7. The Centre is operated jointly by the Agency and UNESCO and is supported by the Italian Government; SIDA also participates in its financing. UNDP finances projects in applied mathematics and computer science, with UNESCO as executing agency, and in solid state physics, with UNESCO and the Agency as executing agencies.

STRUCTURE

H. 8. This programme consists of seven sub-programmes, which are dealt with separately below.

SUB - PROGRAMMES

Condensed matter physics

OBJECTIVE

H. 9. The objective is to foster training and research in condensed matter physics in developing countries in the light of its relevance to scientific, industrial and technological development.

RESULTS TO DATE

H. 10. This sub-programme was initiated in 1967. Extended courses were held in 1967, 1970, 1972 and 1974 and workshops lasting three to four months were organized every year from 1970 to 1975. To date, about 750 scientists have participated in these activities. Approximately 150 preprints and the proceedings of the extended courses have been published.

PLANS FOR 1977-78

H. 11. It is planned to organize a "Solid State Workshop" in 1977 and a "Solid State Winter College" followed by a workshop in 1978.

PLANS FOR 1979-82

H. 12. It is planned to organize further workshops in condensed matter physics in 1979 and 1981 and an extended course followed by a workshop in each of the years 1980 and 1982.

High-energy and particle physics

OBJECTIVE

H. 13. The objective is to provide a forum for international collaboration in the most advanced fields of research in fundamental theoretical physics at the highest possible level and to enable university teachers from developing countries to attend the Centre, bring their knowledge up to date and exchange ideas concerning their research work.

RESULTS TO DATE

H. 14. This sub-programme was initiated in 1964. One extended seminar was held in 1965, while part of the Symposium on Contemporary Physics - in 1968 - also covered high-energy and particle physics. Two topical meetings were held in 1969, two in 1970, two in 1971, one in 1973 and two in 1974. Research in high-energy physics has been carried out at the Centre since its establishment. About 1900 physicists have participated in this part of the programme as visiting or guest scientists, associate members, fellows, guest lecturers and seminar participants. Approximately 825 preprints and the proceedings of the seminar held in 1965 have been published.

PLANS FOR 1977-78

H. 15. Research will continue throughout 1977 and 1978, and one or more topical meetings relating to current developments will be held if the need arises.

PLANS FOR 1979-82

H. 16. Research will continue throughout this period.

Nuclear physics

OBJECTIVE

H. 17. The objective is to foster research, and training for research, in theoretical nuclear physics with particular regard to the needs of developing countries.

RESULTS TO DATE

H. 18. This sub-programme was initiated in 1964 with a small research group and continued in 1965. Extended courses were organized in 1966, 1969, 1971 and 1973. A larger research group was active from 1966 to 1968. Workshops were organized in 1969, 1971 and 1975. 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 950 scientists have participated in these activities. Proceedings of the extended courses have been published.

PLANS FOR 1977-78

H. 19. A "Nuclear Physics Workshop" will be organized in 1977.

PLANS FOR 1979-82

H. 20. It is planned to organize an extended course or a workshop in 1979 and in 1981.

Plasma physics

OBJECTIVE

H. 21. The objective is to provide a forum for high-level international collaboration in the light of the scientific interest of the subject and its potential contribution to the generation of energy by thermonuclear fusion.

RESULTS TO DATE

H. 22. This sub-programme was initiated in 1964 and an extended course was held in that year. A small working party worked at the Centre throughout the period 1964-65, and its membership was increased in 1965-66. Research sessions were organized in 1970 and 1973. Approximately 210 scientists have participated in these research activities. About 60 preprints and the proceedings of the extended course held in 1964 have been published. Excellent collaboration between American, Soviet and European plasma physicists has characterized the research sessions.

PLANS FOR 1977-78

H. 23. An extended course on plasma physics will be organized in 1977.

PLANS FOR 1979-82

H. 24. Research workshops will be organized in 1979 and 1982 and an extended course in 1980.

Atomic, molecular and laser physics

OBJECTIVE

H. 25. The objective is to provide an international scientific forum for exchanging ideas and carrying out research in atomic and molecular physics and in quantum optics and laser physics.

RESULTS TO DATE

H. 26. In 1973 the Centre for the first time organized a three-month "Winter College" on atoms, molecules and lasers; it was attended by 99 lecturers and participants.

PLANS FOR 1977-78

H. 27. An extended course will be organized in 1977 and a workshop is planned for 1978.

PLANS FOR 1979-82

H. 28. An extended course will be organized in 1981. Workshops are planned for 1980 and 1982.

Astrophysics and relativity

OBJECTIVE

H. 29. The objective is to organize workshops where leading and junior astrophysicists and scientists working in the field of relativity theory can discuss the most recent developments.

RESULTS TO DATE

H. 30. Many astrophysicists have already visited the Centre, during the Symposium on Contemporary Physics, at which 13 survey papers by leading scientists were presented. Conferences - on Late-type Stars (1965), Mass Loss from Stars (1968) and Supergiant Stars (1971) - organized by the University of Trieste and held on the Centre's premises have

given physicists present at the Centre at the time a chance to familiarize themselves with the problems of astrophysics; about 300 physicists attended these conferences. A research session on astrophysics and relativity was organized in July-August 1973, with 63 scientists taking part and 13 preprints being published. A workshop on compact X-ray sources was organized in 1974 and a meeting on recent developments in the fundamentals of general relativity in 1975.

PLANS FOR 1977-78 and 1979-82

H.31. It is planned to organize summer research sessions and also a topical meeting, possibly every year. The size of the research groups will depend on the availability of resources.

Biophysics

OBJECTIVE

H.32. The objective is to bring the specialized knowledge and skills of physicists, mathematicians and biologists to bear on particular problems.

RESULTS TO DATE

H.33. A small part of the Symposium on Contemporary Physics was devoted to biophysics. In 1972, during the Summer College on Global Analysis and its Applications, a small group of physicists, biologists and physicians met for three days to discuss neural networks. A summer school on the physics and mathematics of the nervous system, sponsored partly by the Volkswagen Foundation and attended by 89 scientists, was held in August 1973.

PLANS FOR 1977-78

H.34. Small meetings will be held in 1977 or 1978.

PLANS FOR 1979-82

H.35. It is planned to hold courses or research workshops if the need arises.

NON-AGENCY ACTIVITIES

H.36. During the period 1977-78, projects financed by UNDP and with UNESCO as executing agency will be carried out at the Centre: an extended course on geophysics, one on systems analysis (in collaboration with IIASA) and one on applicable mathematics are planned for 1977; workshops on earth sciences and applicable mathematics are foreseen for 1978. Depending on the availability of UNDP financial support, it is planned to organize extended courses or workshops on applied mathematics or computer science and on earth sciences, including the physics of the oceans and the atmosphere, every year during the period 1979-82.

H.37. Other non-Agency activities will include courses on science teaching in 1977, again depending on science curricula and the availability of funds. These courses will emphasize modern teaching methods.

Statistical data on the Centre's activities

Table H. 4

Year	Research: Number of visiting and guest scientists, fellows, associates and guest lecturers	Extended Seminars[a] and Topical Meetings: Number of lecturers and participants	Total number of visitors	Man-months		Number of preprints and internal reports		Number of countries represented	
				Total	From developing countries %	Total	Written by scientists from developing countries	Total	Developing
1964-1965[b]	83	71	154	410	44.0	91	39	40	16
1965-1966[b]	128	113	241	541	37.0	124	58	37	18
1966-1967[b]	178	134	312	544	59.2	141	91	40	20
1967-1968[b]	171	405	576	441	63.7	119	71	49	26
1968-1969[b]	264	347	611	586	58.6	142	81	50	33
1970[c]	399	183	582	864	45.0	154	81	53	35
1971[c]	241	644	885	533	60.7	160	125	68	37
1972[c]	298	590	888	1 214	57.4	161	108	71	53
1973[c]	297	581	878	1 258	58.7	194	142	64	47
1974[c]	283	579	862	854	68.9	141	104	65	48
1975[c]	302	604	906	1 035	65.6	153	122	78	58

Percentage of the Centre's resources for scientific activities expended for the benefit of scientists from developing Member States since 1970:

YEAR	1970	1971	1972	1973	1974	1975
%	68	67	58	72	71	75

a/ Extended Seminars and Courses normally last over three months.

b/ Academic years.

c/ Calendar years.

I. NUCLEAR POWER AND REACTORS

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table I. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	830 955	993 000	90 000	34 000	124 000	1 117 000	1 245 000
Consultants	47 460	80 000	6 000	33 000	39 000	119 000	126 000
Overtime	-	1 000	-	(1 000)	(1 000)	-	-
Temporary assistance	2 305	2 000	200	13 600	13 800	15 800	5 200
Sub-total	880 720	1 076 000	96 200	79 600	175 800	1 251 800	1 376 200
Common staff costs	248 620	289 500	36 000	10 500	46 500	336 000	374 000
Travel	36 288	50 000	2 500	23 500	26 000	76 000	101 000
Meetings							
Conferences, symposia, seminars	43 820	57 000	3 000	224 000	227 000	284 000	85 000
Technical committees, advisory groups	77 707	192 000	10 000	(16 000)	(6 000)	186 000	153 000
Representation and hospitality	7 439	7 000	600	-	600	7 600	7 800
Scientific and technical contracts	81 377	98 000	3 000	-	3 000	101 000	119 000
Scientific supplies and equipment	913	-	-	-	-	-	-
Common services, supplies and equipment	2 639	5 500	400	(2 300)	(1 900)	3 600	4 000
Transfer of costs:							
Linguistic services	91 421	92 000	10 000	(2 000)	8 000	100 000	120 000
Printing and publishing services	258 221	257 000	20 000	131 000	151 000	408 000	410 000
Data processing services	148 012	100 000	10 000	124 000	134 000	234 000	250 000
TOTAL	1 877 177	2 224 000	191 700 8,6%	572 300 25,7%	764 000 34,3%	2 988 000	3 000 000
Regular programme	1 877 177	2 224 000	191 700	169 300	361 000	2 585 000	3 000 000
International conference on nuclear power and its fuel cycle	-	-	-	403 000	403 000	403 000	-
TOTAL	1 877 177	2 224 000	191 700	572 300	764 000	2 988 000	3 000 000

SUMMARY OF MANPOWER

Table I. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	11	11	11	-	11	11
P-4	12	12	12	2	14	14
P-3	3	3	3	1	4	4
P-2	2	2	2	-	2	2
Sub-total	29	29	29	3	32	32
GS	14	14	14	2	16	16
TOTAL	43	43	43	5	48	48

CHANGES IN COSTS AND MANPOWER

Costs

I. 1. As will be seen from Table I. 1 above, it is expected that the cost of this programme will increase by $764 000 in 1977, of which $191 700 will be required to cover salary and other price increases and $572 300 is a programme increase. The latter includes $169 300 in respect of the regular programme, and $403 000 for the cost of holding the International Conference on Nuclear Power and its Fuel Cycle and publishing the proceedings of the conference. The cost of the conference is shown separately in Table I. 1 since it is a one-time event in which several other programmes, together with the "Nuclear power and reactors" programme, participate.

I. 2. The programme increase of $44 500 in respect of salaries for established posts and common staff costs is the net result of the addition of three Professional and two GS posts and delays in the recruitment for vacant posts. The programme increases of $33 000 in respect of consultants' services and of $13 600 in respect of temporary assistance are related mainly to the "Study of regional nuclear fuel cycle centres" under the "Fuel cycle technology" sub-programme. In view of the importance of this programme component for developing countries, resources in addition to those specified in the budget estimates for 1976 are being made available by ERDA, UNEP and IBRD this year. Since no manning table posts have been assigned to the component, as can be seen from Table I. 6, the work will be carried out and completed with the help of consultants, temporary assistance and cost-free experts.

I. 3. It is planned to hold the same number of symposia and seminars in 1977 as were included in the budget estimates for 1976, i. e. one symposium and one seminar. Since no interpretation will be provided for seminars in 1977, there would be a programme reduction in respect of this item. The inclusion of an amount of $233 000 in respect of the cost of holding the International Conference on Nuclear Power and its Fuel Cycle results, however, in a programme increase for conferences, symposia and seminars of $224 000.

I. 4. The programme decrease of $16 000 is foreseen in respect of advisory groups and technical committees.

I.5. Of the programme increase of $23 500 in respect of travel, $18 000 is for the "Study of regional nuclear fuel cycle centres" and the balance is mainly for the "Nuclear power project implementation" sub-programme. It is intended to purchase less computing equipment in 1977 than is budgeted for this year, which results in a programme decrease in respect of common services, supplies and equipment.

I.6. Taking into account the fact that for the proceedings of the International Conference on Nuclear Power and its Fuel Cycle an amount of $170 000 has been included for printing and publishing services, as shown in Table I.10 below, the programme increase of $131 000 under this item is turned into a programme decrease for the regular programme. Of the programme increase of $124 000 in respect of data processing services, an amount of $30 000 will be required for the "Study of regional nuclear fuel cycle centres" and the balance for the "Energy forecasts and power economics" sub-programme.

Manpower

I.7. As will be seen from Table I.2 above, the addition of three Professional and two GS posts is foreseen for 1977.

I.8. For the "Energy forecasts and power economics" sub-programme, an additional P-4 post will be required for a senior engineer with extensive experience in analytical work, modelling and development of computer programs in relation to energy forecasts, electric power demand and nuclear power programmes. One additional GS post will be needed to provide clerical and secretarial support.

I.9. For the "Nuclear material resources, exploration, evaluation, supply and demand" sub-programme an additional P-4 post will be needed for a senior engineer with experience in the technical and economic aspects of uranium ore mining, milling and conversion, and a GS post will be required for secretarial support.

I.10. An additional P-3 post will be needed for an engineer with some experience in training, to elaborate training programmes and deal with the selection of candidates and follow-up of training courses in the "Nuclear power project implementation" sub-programme.

I.11. No further change in the manning table is foreseen for 1978.

THE PROGRAMME

OBJECTIVE

I.12. The objective is to provide integrated assistance to Member States in the planning and implementation of national nuclear power programmes, including fuel cycle services, and to help in improving the reliability of nuclear power plants by:

(a) Giving interested Member States technical and economic advice in connection with their programmes;

(b) Collecting and disseminating evaluated and systematized information on nuclear power requirements and on proven and new nuclear technologies; and

(c) Assessing the role of nuclear power, compared to other energy options, in meeting world energy demands within financing, environmental and manpower availability constraints.

STRUCTURE

I.13. This programme consists of six sub-programmes:

Energy forecasts and power economics;

Nuclear material resources, exploration, evaluation, supply and demand;

Fuel cycle technology;

Nuclear power project implementation;

Technology of nuclear power plants of proven types; and

Advanced nuclear power technology and reactor physics.

Summary of manpower and costs by sub-programme

Table I. 3

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years		Costs	Man-years		Costs
	P	GS		P	GS	
Energy forecasts and power economics	8,5	3,0	584 000	8,5	3,0	718 000
Nuclear materials resources, exploration, evaluation, supply and demand	5,0	2,5	455 000	5,0	2,5	489 000
Fuel cycle technology	4,3	2,5	437 000	4,3	2,5	411 000
Nuclear power project implementation	4,0	2,0	380 000	4,0	2,0	475 000
Technology of nuclear power plants of proven types	6,0	4,0	396 000	6,0	4,0	493 000
Advanced nuclear power technology and reactor physics	4,2	2,0	333 000	4,2	2,0	414 000
Sub-total	32,0	16,0	2 585 000	32,0	16,0	3 000 000
International conference on nuclear power and its fuel cycle	-	-	403 000	-	-	-
TOTAL	32,0	16,0	2 988 000	32,0	16,0	3 000 000

SUB-PROGRAMMES

Energy forecasts and power economics

OBJECTIVE

I.14. The objective is to:

(a) Prepare supply and demand forecasts with regard to primary energy, electric power and nuclear power on a national, regional and world basis; and

(b) Carry out economic comparisons on the basis of a consistent methodology in order to maintain an up-to-date picture of the present and future competitive status of nuclear energy, study the financing of alternative energy programmes and provide background information and other data essential in assisting Member States with nuclear power planning and the assessment of the future role of nuclear energy.

RESULTS TO DATE

I.15. Estimates of the consumption, production and costs of primary energy, electric power and nuclear power have been prepared on a world and regional basis and are constantly being up-dated. These estimates have been used for a general assessment of the share of nuclear energy in the total world energy supply and as background material for surveys requested by Member States and for training courses and handbooks in the field of nuclear power. Particular efforts have been devoted to the analysis of the demand for nuclear fuel-cycle services, and several computer programs have been developed so that immediate estimates can be made of natural uranium and enrichment services requirements arising from any change in nuclear programmes.

I.16. Comprehensive computer programs for the economic analysis of electric power systems have been developed with the help of consultants and advisory groups. The resulting methodologies have served as a basic tool in carrying out nuclear power planning surveys in selected countries and in training utility engineers from those countries at Headquarters. Computer codes have been released and training of varying intensity given in the case of the following countries and organizations: Brazil, Greece, the Federal Republic of Germany, Indonesia, Malaysia, Mexico, Pakistan, Singapore, Thailand, the United Kingdom (Hong Kong), IBRD, the Inter-American Development Bank and the United Nations Economic and Social Commission for Asia and the Pacific. In addition, codes have been released to Italy, Turkey and New Zealand, and expressions of interest have been received from Finland, Guatemala and the Asian Development Bank. Case studies involving the application of codes have been carried out during Agency training courses.

PLANS FOR 1977-78

I.17. Computer programs relating to uranium demand and resources, fuel cycle services and nuclear power - developed in connection with work on "Nuclear material resources, exploration, evaluation, supply and demand", "Fuel cycle technology" and "Nuclear power plant operating experience" - will be used as first steps towards the establishment of an energy data bank within the Agency. Models for forecasting primary energy and electric power demand, which are indispensable for an assessment of future trends and of related effects on the fuel cycle (as regards uranium demand and resources, fuel services, etc.) will be developed. Up-to-date estimates of the demand, arising from nuclear power programmes, for reactor fuel and fuel cycle services will be made regularly.

I.18. For these activities, which include analytical work, modelling and the development of computer programs, it is foreseen that in 1977 an additional Professional staff member (at the P-4 level) and an additional GS staff member will be needed.

I.19. With regard to the methodology and codes for the analysis of the expansion of electric power systems and of nuclear power programmes, the present codes will be substantially improved and the results which they yield compared with those obtained using other methods. A review of methods for the analysis of energy demand forecasts will be carried out in 1977 (Advisory Group - Annex II (23)); in particular, different reactor types will be considered, a better approach to the role of hydroelectricity adopted and transmission considerations brought within the scope of the analysis. The introduction of financial constraints into the analysis through the development of a financial model will further improve the reliability of nuclear power forecasts relating to developing countries.

I.20. The competitiveness of nuclear power, the financing of nuclear power programmes and reactor strategies will be discussed at the Conference on Nuclear Power and its Fuel Cycle to be held at Salzburg in 1977 (Conference - Annex I (21)).

PLANS FOR 1979-82

I.21. It is intended that, during this period, a fully computerized data bank covering all forms of energy and containing information about demand, supply and cost trends and about various aspects of the fuel cycle will be established within the Agency. Emphasis will, of course, be placed on nuclear power and nuclear fuels, but an independent data base relating to energy and electric power in general will also be built up.

I.22. A comprehensive methodology for the analysis of electric power system expansion which takes full account of financial and manpower availability constraints will be made available systematically to an increasing number of Member States through individual and group training.

I.23. This type of highly specialized work will, as hitherto, be carried out by Agency staff members with the support of consultants. There will be periodic meetings with experts from advanced and developing countries, since the aim is to perfect practical tools which will immediately be made available to Member States through training. The scope and duration of the training will be in keeping with the requirements of the requesting countries, the number of which - judging by past experience - is likely to increase.

CO-OPERATION WITH OTHER ORGANIZATIONS

I.24. Existing co-operation with other international organizations active in the energy field will be strengthened; prominent among these are the Secretariat and regional commissions of the United Nations, IBRD, the regional development banks, OECD, UNEP and IIASA. In addition, working contacts with the Commission of the European Communities, CMEA, the International Energy Agency and OPEC will have to be established and expanded.

Energy forecasts and power economics

Summary by programme components

Table I.4

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Energy forecasts and power economics	8,5	3,0	415 300	9 500	-	10 200	435 000
Linguistic, printing and publishing services	-	-	-	-	-	45 000	45 000
Data processing services	-	-	-	-	-	104 000	104 000
TOTAL	8,5	3,0	415 300	9 500	-	159 200	584 000

Nuclear material resources, exploration, evaluation, supply and demand

OBJECTIVE

I.25. The objective is to maintain an up-to-date picture of world uranium and thorium resources, production and demand, to collect and amalgamate information on related subjects such as uranium geology, exploration and evaluation techniques, mining and ore processing, and to assist and advise developing Member States in connection with the exploration, development and economic exploitation of their indigenous uranium resources.

RESULTS TO DATE

I.26. Two symposia, five advisory group or technical committee meetings, two consultants' meetings and a number of special working group meetings have been held on uranium geology, exploration, evaluation and ore processing. The OECD(NEA)/IAEA Working Party on Uranium Resources has reviewed world uranium resources, production capacities and demand on two occasions as part of an earlier programme, which is continuing, and has established a committee to deal with research and development and policy matters relating to uranium exploration. Another committee has been set up within the Agency, in collaboration with OECD(NEA), to deal with common standards of reporting uranium reserves and resources.

I.27. Co-ordinated research programmes on three major subjects connected with uranium exploration and ore processing have been administered, together with a number of individual research contracts relating to those subjects.

I.28. As part of the programme to provide technical assistance to developing Member States, five large-scale UNDP-financed uranium exploration projects - in Chile, Greece, Morocco, Pakistan and Turkey - have been administered.

I.29. Small-scale projects in a further 25 countries, financed either by UNDP or under the Agency's regular programme, have been supervised and three regional or interregional training courses on uranium exploration methods have been held.

PLANS FOR 1977-78

I.30. The OECD(NEA)/IAEA Working Party on Uranium Resources will be reconvened in 1977, and possibly in 1978, with the objective of producing a new report (Technical Committees - Annex II (24 and 25)). The two committees whose establishment is mentioned above under "Results to date" will meet in 1977 (Technical Committees - Annex II (26 and 27)) and 1978 (Technical Committees).

I.31. In-house experts and outside consultants will prepare training programmes and technical manuals on uranium exploration techniques and the standardization of resource evaluation methods. The collection of information on uranium exploration (for example, information on advanced methods for recognizing uraniferous regions) will be intensified. Data on uranium geology will be reviewed in 1977 (Advisory Group - Annex II (28)) and data on uranium geochemistry in 1978 (Advisory Group).

I.32. The building-up of a computer file with information on uranium - to form part of the energy data bank mentioned in the sub-programme entitled "Energy forecasts and power economics" - will continue.

I.33. The establishment of task forces, consisting of consultants, to assist Member States with general assessments of their indigenous uranium resources and exploration policies may be initiated in 1977, in co-operation with OECD(NEA). The basic systematized

information on uranium resources, geology, exploration, evaluation and ore processing and on related subjects which has been assembled will be used in providing advice and support to Member States.

I.34. Material on uranium exploration, resources and demand will be prepared for the Conference on Nuclear Power and its Fuel Cycle and material on uranium resources information prepared for the 1977 World Energy Conference.

I.35. Following completion this year of the co-ordinated research programme on the bacterial leaching of uranium ores (Table I. 11, No. 1), new co-ordinated research programmes covering a number of specialized subjects in the uranium resources field are expected to be established.

I.36. In view of the anticipated increase in the activity involved in this programme component, particularly with regard to uranium ore processing, an additional Professional staff member (at the P-4 level) and an additional GS staff member will be needed.

RELATED ACTIVITIES

I.37. It is expected that there will be an increase in the number of requests relating to large-scale projects received and met and also in the number of requests relating to small-scale projects, which has been rising steadily in recent years. In view of the success of the training courses on subjects connected with uranium exploration, it is proposed that at least one such course be held each year. A seminar on uranium evaluation and mining methods will be held in 1977 (Seminar - Annex I (19)).

PLANS FOR 1979-82

I.38. The OECD(NEA)/IAEA Working Party on Uranium Resources will continue to conduct reviews at intervals of about two years; the two committees whose establishment is mentioned above under "Results to date" will also continue to meet. The concept of Agency task forces to assist Member States in making inventories of their indigenous uranium resources will be developed further. It is foreseen that there will be an increasing need for uranium exploration and development, which will be reflected in a larger number of technical assistance requests and programmes.

CO-OPERATION WITH OTHER ORGANIZATIONS

I.39. The dissemination of information on uranium resources involves co-operation with OECD(NEA), with the geology departments of national atomic energy commissions and with national and international geological and mining organizations.

I.40. Co-operation is being maintained with the International Geological Correlation Programme (sponsored by UNESCO), IIASA and the World Energy Conference. In addition, there are plans for co-operation with uranium resources groups in the Commission of the European Communities, with the International Energy Agency and with the Uranium Institute in London.

I.41. Where technical assistance to developing Member States is involved, co-operation is being maintained with UNDP, the United Nations Centre for Natural Resources, the geology departments of national atomic energy commissions, and national geological and mining institutes; co-operation in the assignment of geoscientists to international development projects is foreseen.

Nuclear materials resources, exploration, evaluation, supply and demand

Summary by programme components

Table I. 5

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Nuclear materials resources, exploration, evaluation, supply and demand	5,0	2,5	237 800	59 200	34 000	9 000	340 000
Linguistic, printing and publishing services	-	-	-	-	-	65 000	65 000
Data processing services	-	-	-	-	-	50 000	50 000
TOTAL	5,0	2,5	237 800	59 200	34 000	124 000	455 000

Fuel cycle technology

OBJECTIVE

I.42. The objective is to assist Member States in acquiring the fuel element fabrication technology which they need, to assist - by fostering the international exchange of information on fuel fabrication, reprocessing and recycling technology - developing countries in establishing their own fuel cycle technology and to participate in the evaluation of the feasibility of regional nuclear fuel cycle centres.

PLANS FOR 1977-82

I.43. It is expected that the relative importance of the main activities comprising this sub-programme will have to be reassessed in the light of the conclusions of the Conference on Nuclear Power and its Fuel Cycle and that more effort will be devoted to those parts of the fuel cycle which are, either technically or economically, the most important from the point of view of achieving an overall balance.

I.44. Emphasis will be placed on quality assurance in nuclear fuel production and performance as an important contribution to the reliability of both proven and advanced nuclear power plant types. International collaboration in connection with the likely implementation of regional nuclear fuel cycle centre projects will be encouraged.

STRUCTURE

I.45. This sub-programme consists of three components, which are described in the following paragraphs.

Fuel cycle technology

Summary by programme components

Table I. 6

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Fuel element technology	2,3	1,3	107 500	13 600	9 000	3 500	133 600
Fuel reprocessing and recycling	2,0	1,2	94 300	13 600	9 000	3 500	120 400
Study of regional nuclear fuel cycle centres	-	-	50 000	-	-	18 000	68 000
Linguistic, printing and publishing services	-	-	-	-	-	85 000	85 000
Data processing services	-	-	-	-	-	30 000	30 000
TOTAL	4,3	2,5	251 800	27 200	18 000	140 000	437 000

Fuel element technology

Objective

I.46. The objective is to collect, review and provide for the international exchange of information on fuel research and development and technology, with special emphasis on quality assurance and to advise developing countries on the establishment of fuel element fabrication facilities.

Results to date

I.47. The main economic and technical features of fuel element technology were reviewed in 1972 by a study group on the facilities and technology needed for nuclear fuel fabrication. A symposium on fuel and fuel elements for fast breeder reactors and a panel on sol-gel processes for the fabrication of fuel for high-temperature reactors (HTRs) were held in 1973. The performance of fuel elements in commercial power reactors has been reviewed.

I.48. Advisory group meetings on fuel element behaviour during reactor operation and the technical and economic evaluation of methods of quality control in nuclear fuel fabrication were held in 1974 and 1975, UO_2 fuels being dealt with in 1974 and $(U, Pu)O_2$ fuels for recycling in light-water reactors (LWRs) in 1975.

I.49. Requests from Argentina, Brazil and Mexico for advice on fuel element fabrication have been met and assistance has been given in connection with the UNDP project in Romania.

I.50. An international working group on nuclear fuel performance and technology (IWGFPT) is being established this year; it will carry out annual reviews and recommend Agency action in the areas of fuel performance, fabrication technology and quality assurance.

I.51. Since 1975 the activities comprising this component are being closely co-ordinated with those comprising the component entitled "Study of regional nuclear fuel cycle centres".

I.52. The formulation of standard technical specifications and the preparation of manuals on quality assurance in fuel manufacture were initiated in 1975. A manual on quality assurance and control for metal-clad UO_2 fuels is being issued this year.

I.53. Preparation of a manual describing the various aspects of nuclear fuel fabrication and entitled "Steps to Domestic Fuel Fabrication" began in 1975. The manual, which is to be issued this year, is intended as introductory material for the use of planners and managers in developing countries.

Plans for 1977-78

I.54. The activities to be undertaken as a matter of urgency are the collection and dissemination of information which will lead to an understanding of the difficult technology involved in the fabrication and quality assurance of nuclear fuel elements.

I.55. More effort will be devoted to the preparation of manuals on quality assurance in fuel manufacture, the development of standardized quality control procedures and the formulation of reference technical specifications and codes.

I.56. The collection and dissemination of information on progress made and research still needed will continue in the fuel development and fuel performance areas for all proven reactor types and in related areas such as fuel enrichment techniques, cladding materials and the thermodynamics of nuclear materials. This activity, which will be carried out with the assistance of IWGFPT, will entail the convening of one technical committee in 1977 (Technical Committee - Annex II (29)) and one in 1978 (Technical Committee).

I.57. A research programme on the behaviour of high-temperature thermometers under reactor operating conditions will be initiated, this activity being co-ordinated with those comprising the sub-programme entitled "Technology of nuclear power plants of proven types".

I.58. A review of this work will be included in the programme of the Conference on Nuclear Power and its Fuel Cycle.

I.59. A symposium on fuel element cladding materials including zirconium will be held in 1978 (Symposium - Annex III (7)).

Related activities

I.60. There are plans to hold a regional seminar on fuel element quality control for the Latin American countries in 1978.

Fuel reprocessing and recycling

Objective

I.61. The objective is to collect, review and provide for the exchange of research and development and other technological information on fuel reprocessing and plutonium recycling, taking into consideration environmental constraints and general fuel cycle economics.

Results to date

I.62. Plutonium recycling was analysed by advisory groups convened in 1971 and 1974. The status of liquid-metal fast breeder reactor (LMFBR) fuel reprocessing is being reviewed by an advisory group this year. Technical assistance has been provided to several developing countries.

Plans for 1977-78

I.63. The activities constituting this component will continue to be carried out in collaboration with the Division of Nuclear Safety and Environmental Protection and will be co-ordinated with the "Study of regional nuclear fuel cycle centres".

I.64. Data on existing and planned reprocessing facilities will be collected and evaluated. The influence of environmental constraints on fuel reprocessing costs and the overall need for reprocessing services will be studied. Since problems associated with the back end of the fuel cycle may limit the further development of nuclear power, there are plans to set up an international working group on the reprocessing of irradiated fuels. It will be necessary to convene one technical committee each year and also to hold specialists' meetings (Technical Committee - Annex II (30)).

I.65. The status of reprocessing and the relevant Agency programme will be reviewed in 1978 (Advisory Group).

Plans for 1979-82

I.66. Attention will be paid to the reprocessing of fuel from fast reactors and HTRs, to plutonium recycling, to the development of new techniques and facilities and to operating experience with and the technical, economic and safety aspects of the large facilities for LWR fuel element reprocessing which are expected to enter service in the second half of the 1970s. A number of requests from developing countries for technical assistance and advisory missions are expected.

Co-operation with other organizations

I.67. The activities comprising this component involve co-operation with national atomic energy commissions and with various reprocessing organizations in the private sector.

Study of regional nuclear fuel cycle centres

Objective

I.68. The objective is to evaluate, on the basis of nuclear power growth projections and in the light of the complex technological, economic and other issues involved, the soundness of the concept of regional nuclear fuel cycle centres. The study will cover the technical and economic aspects of spent fuel transport and storage, fuel reprocessing, fuel fabrication and radioactive waste processing and disposal and also the legal, institutional, financial, material security and environmental aspects of the establishment of such multinational regional centres.

Results to date

I.69. In view of the importance attached to this study and the keen interest expressed by a number of Member States at the time of the nineteenth regular session of the General Conference, the activities comprising this component have been substantially expanded and the Director General has established - with effect from October 1975 - a unit for the study of regional nuclear fuel cycle centres under the Deputy Director General for Technical Operations. Member States have been asked to provide information and assistance in connection with the study.

I.70. Preparation of the mathematical models and associated computer codes for analysing the flow of materials in the fuel cycle and for evaluating various strategies for reprocessing, storage, transportation, fabrication and waste management is nearing completion.

I.71. The establishment of a data bank containing the information needed as inputs into the mathematical models and also empirical data, such as the capital and operating costs of various plants as a function of size, is well advanced.

I.72. A system for determining optimum strategies and carrying out sensitivity analyses is nearing completion.

I.73. The experience of similar multinational ventures has been reviewed and frameworks covering the legal, institutional, financial and other aspects of the establishment of regional centres are being developed.

Plans for 1977-78

I.74. The preparation of the mathematical models and associated computer codes and the establishment of the data bank will be completed; thereafter only periodic up-dating will be necessary.

I.75. The development of the frameworks covering the legal, institutional, financial and other aspects will be completed in co-operation with experts from interested Member States.

I.76. A report on the methodology developed for the evaluation of alternative strategies for the establishment of integrated regional nuclear fuel cycle centres will be prepared; it is intended that the report will be presented at the Conference on Nuclear Power and its Fuel Cycle. The report will include examples of economically viable sizes and of how such centres might be distributed with respect to the nuclear power generation pattern in various regions during the period 1976-2000. It will also indicate the impact which different spent fuel storage and reprocessing strategies might have on fuel supply and demand and on the need for spent fuel storage and reprocessing, for fuel fabrication and for waste management.

I.77. Regional case studies will be carried out in response to proposals received from Member States; they would cover technical and economic aspects and also institutional, legal, financial and other, related aspects of establishing regional nuclear fuel cycle centres.

I.78. The activities comprising this component will involve co-operation between the Division of Nuclear Power and Reactors, the Division of Nuclear Safety and Environmental Protection, the Legal Division and the Division of External Relations.

Plans for 1979-82

I.79. Once the capability for evaluating proposals connected with the establishment of regional centres has been built up, in-depth surveys could be carried out for groups of Member States submitting such proposals. Comprehensive analyses would be made with a view to identifying different options for the formulation of a strategy for a given region.

Co-operation with other organizations

I.80. The Agency has received financial assistance from and is co-operating with UNEP, IBRD and the Government of the United States of America.

Nuclear power project implementation

OBJECTIVE

I.81. The objective is to assist Member States in nuclear power planning and in the implementation of nuclear power projects.

PLANS FOR 1977-82

I.82. The rapid increase in the number of developing countries embarking on nuclear power programmes and the number of nuclear power plants involved is expected to lead to the Agency's receiving considerably more requests both for assistance and for advisory services during the period 1977-82 than hitherto. Probably, the emphasis will at first be on assistance in planning nuclear power programmes, a form of assistance which has become well established. During the period 1977-82, however, it is likely to shift towards project-related assistance and advice as the number of plants under construction increases. If this happens, there will be a need for more comprehensive and up-to-date information about the technical and economic aspects of nuclear power programmes and about the availability of plants. In addition to the direct assistance and advice provided to Member States on request, training programmes will have to be supported and handbooks published.

STRUCTURE

I.83. This sub-programme consists of two components, which are described in the following paragraphs.

Nuclear power project implementation

Summary by programme components

Table I. 7

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Survey of nuclear power in developing countries	1,0	0,5	51 700	11 000	5 000	5 000	72 700
Nuclear power planning studies and guidelines for project implementation	3,0	1,5	151 200	18 600	-	21 500	191 300
Linguistic, printing and publishing services	-	-	-	-	-	66 000	66 000
Data processing services	-	-	-	-	-	50 000	50 000
TOTAL	4,0	2,0	202 900	29 600	5 000	142 500	380 000

Survey of nuclear power in developing countries

Objective

I.84. The objective is to collect and keep up to date information on the demand for nuclear power plants in developing countries and the possibility of meeting it.

Results to date

I.85. This component was initiated in 1971. Missions were sent to 14 Member States and the results of a market survey of the potential demand for nuclear power in these countries were presented to the General Conference in 1973. One of the main purposes of this survey was to demonstrate the potential market for small and medium (below 600 MW(e)) power reactors. In 1974, further developing countries were covered, bringing the total to 55, and the original market survey results were up-dated. This was done in the light of

the increase in oil prices which occurred late in 1973, and which led to a great expansion in the potential market for small- and medium-power reactors, and of the increasing capital costs of power plants. The expansion in the potential market prompted a renewal of efforts to help meet the demand for reactors in the size ragne below 600 MW(e) by informing suppliers of the situation. A first panel meeting of Government and industry representatives to exchange information about the most recent market estimates and to review the available reactor designs was held in November 1974. It was followed, in July 1975, by an advisory group meeting of a similar kind where a catalogue of available designs was compiled. During the nineteenth regular session of the General Conference, this catalogue was discussed at a meeting attended by the representatives of countries with a potential interest in smaller power reactors.

I.86. During the present year, efforts to collect increasingly reliable economic data as an aid to developing countries in deciding on new power plants have continued. In addition, further designs for small- and medium-power reactors have been sought.

Plans for 1977-78

I.87. The up-dating of information on the prospects for nuclear power in developing countries will continue, with the incorporation of data on countries for which nuclear power planning studies are performed and of new data on current programmes supplied by Member States. Information on the costs of completed projects in developing countries will be collected in 1977 and reviewed in 1978.

I.88. Developments regarding the availability of small- and medium-power reactors will be followed in 1977 (Advisory Group - Annex II (31)) and 1978. It is expected that particular attention will be paid in 1977 to the market for nuclear process heat in industrial countries, which should increase the interest of manufacturers in building smaller power reactors. This activity will be co-ordinated closely with those comprising the programme component entitled "Nuclear heat applications". Consultants will be engaged to help clarify questions of financing the construction of power reactors, including criteria for determining whether particular power reactor systems are "proven".

Plans for 1979-82

I.89. Advisory group and consultants' meetings will be held to the extent necessary for up-dating information on nuclear power plant demand and availability.

Nuclear power planning studies and guidelines for project implementation

Objective

I.90. The objective is to provide guidance, particularly for developing Member States, in the planning, evaluation and implementation of nuclear power projects and to assist in training staff.

Results to date

I.91. This component was initiated in 1959, with the title "Assistance in nuclear power planning". Special missions have been sent and advisory services provided to numerous developing countries to help in assessing the need for nuclear power programmes. Complete nuclear power planning studies have been performed for Bangladesh, Indonesia, Hong Kong, Jamaica, Pakistan, Peru and Venezuela.

I.92. The Agency has participated as executing agency in a detailed feasibility study for the first nuclear power station in the Philippines, and a similar UNDP-financed feasibility study is being initiated in Indonesia this year. A nuclear power advisory study of smaller scope for Kuwait was completed in 1975, and similar studies for Panama and Uruguay will be completed this year.

I.93. Training in the methodology of power planning studies and the associated computer program have been provided to several countries, international organizations and institutions. Numerous training courses on technical and economic aspects of nuclear power have been held. A UNDP seminar for executive-level national authority staff was held in Jamaica in 1975. A series of 15-week training courses in nuclear power planning and implementation began with a course at the Kernforschungszentrum Karlsruhe in September 1975; the series is continuing this year with similar courses at Karlsruhe, the Argonne National Laboratory and at the Centre d'études nucléaires de Saclay.

I.94. A handbook on the main steps in the decision process leading to the initiation of a nuclear power programme was published in 1975; a similar one on planning for national participation in nuclear power projects and fuel procurement is being published this year.

Plans for 1977-78

I.95. Further requests for preliminary nuclear power advisory studies and planning studies are expected, and it is intended that approximately two advisory studies and three planning studies will be performed each year for requesting Member States.

I.96. In nuclear power planning studies, the economic ground rules, timing of national economic plans and the limitations specific to particular countries will receive greater attention than in the past. The methodology used will be continually improved, priority being given to load-forecasting techniques and more realistic mathematical modelling of hydro-electric systems. The input data especially the economic parameters, will be systematically reviewed. The scope of nuclear power planning studies will be increased through the inclusion of organizational, administrative and financing aspects.

I.97. It is expected that requests for advisory services will relate increasingly to various aspects of projects in progress, such as the establishment of quality assurance programmes and the technical aspects of planning, and that the already considerable effort in support of the Agency's technical assistance programme will have to be increased. The Agency will probably be called upon to execute further UNDP projects both at the national and at the regional level - for example, nuclear power project feasibility studies or studies relating to national participation in such projects and also large-scale projects for training engineers.

I.98. A programme for training in various aspects of national participation in nuclear power projects will be prepared in 1978 (Advisory Group), and a seminar on this subject is planned for 1978.

I.99. The training courses on nuclear power project planning and implementation in France, the Federal Republic of Germany and the United States will continue during 1977 and 1978, the emphasis shifting slowly from planning to construction and operation management. The Government of Spain is also considering hosting such a training course. Where possible, increasing use will be made of existing training facilities, particularly in developing Member States, the aim being to supplement the Agency's courses with more practical training related to local conditions. A review of manpower requirements and training programmes is planned for 1977 (Advisory Group - Annex II (32)).

I.100. In view of the increasing demands being made on technical Professional staff working in this area, an additional staff member at the P-3 level is needed.

I.101. The preparation of handbooks will continue, with the help of consultants. It is hoped that a handbook on the technical evaluation of bids will be prepared in 1977. In addition, attention will be paid to the problems of operating large power units in small grids and to the related economic trade-offs (for example, between cheaper power and lower supply reliability); a publication of the handbook type on this subject is planned for 1977, to be followed by others in 1978. Regulatory and technical problems connected with the export of nuclear power reactors will be reviewed in 1978 in collaboration with the Division of Nuclear Safety and Environmental Protection (Symposium - Annex III (13)).

I.102. Requests for assistance and advisory services are expected to continue increasing during the period, but with a gradual shift of emphasis from preliminary programming and planning to project-related activities, reflecting the increase in the number of nuclear power programmes established in Member States and the progress made in those programmes. Training and publication activities will be planned in the light of the shift of emphasis.

Co-operation with other organizations

I.103. This component will require regular and close co-operation with the United Nations and its economic commissions, UNDP, UNIDO and IBRD.

Technology of nuclear power plants of proven types

OBJECTIVE

I.104. The objective is to provide Member States with information on the present situation regarding the technology and operation of nuclear power plants of proven types and on their use also for purposes other than electricity production and to give advice on the principles, methods and techniques to be applied in designing, constructing and operating plants so as to help ensure safety and reliability over the intended plant lifetime.

PLANS FOR 1977-82

I.105. It is planned to continue the publication of annual reports on nuclear power plant projects and the performance of operating nuclear power plants. In addition, information on developments in the technology of proven nuclear power reactor systems will be collected through the activities of international working groups and disseminated in the form of publications.

I.106. The importance of quality assurance for nuclear power plants will be reflected in a continuation of the link between this sub-programme and the Agency's activities in the field of nuclear safety standards as they relate to quality assurance. After completion of those activities, this sub-programme will be directed more towards the exchange of information on practical applications and procedures.

I.107. Direct applications of nuclear heat are expected to attract increasing attention, and during this period a continuing programme for the exchange and dissemination of information on such applications is envisaged.

STRUCTURE

I.108. This sub-programme consists of four components, which are described in the following paragraphs.

Technology of nuclear power plants of proven types

Summary by programme components

Table I. 8

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Nuclear power plant operating experience	1,1	1,0	51 800	-	-	500	52 300
Nuclear power plant systems technology and reliability	1,6	1,2	71 100	46 500	-	4 500	122 100
Quality assurance for nuclear power plants	1,6	0,8	72 900	-	5 000	3 500	81 400
Nuclear heat applications	1,7	1,0	80 000	8 200	5 000	2 000	95 200
Linguistic, printing and publishing services	-	-	-	-	-	45 000	45 000
TOTAL	6,0	4,0	275 800	54 700	10 000	55 500	396 000

Nuclear power plant operating experience

Objective

I.109. The objective is to collect, evaluate and publish annually data on operating experience with nuclear power plants in Member States.

Results to date

I.110. This component was initiated in 1969, and since 1970 a report on operating experience with nuclear power plants has been published each year; a new format was introduced in 1973. In 1975, a publication entitled "Power Reactors in Member States" (a computer-based listing of civilian nuclear power reactors) was issued for the first time, in a format permitting it to be of direct use in evaluating the operating performance of power plants.

Plans for 1977-78

I.111. The annual report on operating experience will be supplemented regularly by an analytical report containing operating and outage statistics for nuclear power plants of different types and sizes. This report may be reviewed by consultants if its format needs to be improved.

I.112. "Power reactors in Member States" will be up-dated and re-issued; publication on an annual basis is envisaged.

I.113. It is expected that there will be close co-operation with INIS.

Plans for 1979-82

I.114. As the number of nuclear power plants in operation increases, the present format of the annual report on operating experience may become unsuitable and a new format may therefore be developed. At the same time, the importance of the analytical report containing operating and outage statistics will increase.

Nuclear power plant systems technology and reliability

Objective

I.115. The objective is to collect, evaluate and disseminate information on the principles, methods and techniques for achieving reliability in the design, installation, testing and operation of power plant systems and components, in particular pressure vessel systems and control and instrumentation systems.

Results to date

I.116. The International Working Group on Pressure Vessels (IWGPV) and the International Working Group on Nuclear Power Plant Control and Instrumentation (IWGNPPCI) were established in 1967 and 1970 respectively; since their establishment they have organized two or three specialists' meetings each year. In 1974, the scope of their activities was reviewed in the interests of their both working towards the same general objectives. As a result of this review, the scope of the activities of IWGPV was broadened and the working group's name changed to "International Working Group on the Reliability of Pressure Vessel Components" (IWGRPVC).

Plans for 1977-78

I.117. With the assistance of IWGRPVC and IWGNPPCI, the status of research and development and engineering progress relevant to nuclear power plant systems and components will be reviewed in 1977 (Technical Committees - Annex II (34 and 33)) and 1978 (Technical Committee). Specific technological topics will be the subject of specialists' meetings. Information on design principles, installation techniques and testing and operation procedures will be collected, evaluated and disseminated to Member States through publications containing technical data and indicating requirements and preferred technical solutions for pressure vessel systems and control and instrumentation systems. Efforts will be made to prepare and issue technical manuals of direct interest to countries embarking on nuclear power projects.

I.118. Following the termination this year of a co-ordinated research programme on the embrittlement of pressure vessel components (first report published in 1975), a new programme with a broader scope may be initiated.

I.119. A symposium on the application of reliability technology to nuclear power plants will be held in 1977 (Symposium - Annex I (20)) and one on control and instrumentation (with emphasis on new design trends, reliability and related safety aspects) will be held in 1978 (Symposium - Annex III (8)).

Plans for 1979-82

I.120. More emphasis will be placed on the preparation and dissemination of technical information.

Co-operation with other organizations

I.121. Close co-operation will be maintained with organizations such as ISO, the International Electrotechnical Commission, OECD(NEA), the Commission of the European Communities and CMEA.

Quality assurance for nuclear power plants

Objective

I.122. The objective of this component, which is associated with the Agency's work in the field of codes of practice and safety standards, is to help increase nuclear power plant reliability through better quality assurance practices by formulating recommendations on the planning and carrying-out of quality assurance activities in connection with nuclear power plants.

Results to date

I.123. This component was initiated in 1974. Preparation of a code of practice on quality assurance for nuclear power plants began in 1975 and will be completed this year.

Plans for 1977-78

I.124. It is planned to prepare each year two to four safety guides relating to quality assurance. The subjects for these guides will be selected on the basis of priorities established in the field of safety standards. For each guide one working group meeting will be held to prepare a draft, for the review and approval of which one or two technical committee meetings are envisaged. A principle to be followed in preparing the guides is that the requirements and recommendations shall be such as to assure good quality, preclude unnecessary burdens on plant suppliers and owners and keep the associated documentation as simple as possible. Funds for these activities have been provided in the "Nuclear safety and environmental protection" programme.

Plans for 1979-82

I.125. After completion of the safety guides, this component will be oriented towards the formulation of quality control procedures (for example, inspection and testing procedures) for various phases of a nuclear power project. The preparation of technical information and manuals on specific procedures and of manuals for use in training courses and seminars is foreseen.

Nuclear heat applications

Objective

I.126. The objective of this component, which has developed from the component entitled "Multipurpose applications", is to review the status of and developments in the use of heat from nuclear power reactors in industry, sea-water desalination and district heating with a view to assessing the potential role of nuclear energy in fields other than electricity production.

Results to date

I.127. A technical committee meeting was organized in 1974 to review the status of and plans for the direct use of nuclear heat in Member States. A technical committee meeting is being held this year to discuss technical aspects of district heating by means of nuclear heat.

Plans for 1977-78

I.128. The technology of and experience with nuclear boilers and water heaters will be reviewed in 1977 (Technical Committee - Annex II (35)). The status of nuclear heat applications may be reviewed in 1978 (Technical Committee).

Plans for 1979-82

I.129. Interest in the use of nuclear heat in certain areas is expected to increase during this period, and a number of projects may be implemented. The scope of this component may need to be revised so that it includes topics such as the market for nuclear heat and the technology (including safety and reliability aspects) of single-purpose nuclear reactors for heat production.

I.130. The development of desalination technology will be followed closely and the role which nuclear reactors can play in supplying heat to desalination facilities assessed. Several Member States may request advice in this area.

Co-operation with other organizations

I.131. The activities within this programme component call for close co-operation with and participation in the work of standards organizations such as ISO and the International Electrotechnical Commission and of other organizations such as UNIPEDE, OECD(NEA) and the Commission of the European Communities.

Advanced nuclear power technology and reactor physics

OBJECTIVE

I.132. The objective is to foster information exchange and other forms of technical collaboration among Member States engaged in the development of advanced nuclear reactor and energy conversion systems in cases where considerable international co-operation is necessary owing to the fact that the technological effort and capital investment involved in bringing a system to commercial maturity cannot be expected to be sustained solely at the national level.

PLANS FOR 1977-82

I.133. Account will be taken of the fact that the development of advanced nuclear power systems capable of competing with established systems calls for technological effort of such a magnitude that increased international collaboration is essential. Activities connected with fast breeders, HTRs and related systems will be intensified.

I.134. With continuing progress in controlled thermonuclear fusion research, attention will be paid to the technological aspects of fusion reactor development, including carrying-out of large-scale technical feasibility experiments and the design and construction of prototype devices.

STRUCTURE

I.135. This sub-programme consists of four components, which are described in the following paragraphs.

Advanced nuclear power technology and reactor physics

Summary by programme components

Table I. 9

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
New power reactor technology	1,1	0,6	56 700	26 400	-	2 000	85 100
Advanced reactor concepts	1,0	0,5	46 500	2 000	17 000	1 500	67 000
Reactor physics	1,0	0,5	46 400	10 200	17 000	1 500	75 100
Advanced energy conversion	1,1	0,4	54 600	18 200	-	1 000	73 800
Linguistic, printing and publishing services	-	-	-	-	-	32 000	32 000
TOTAL	4,2	2,0	204 200	56 800	34 000	38 000	333 000

New power reactor technology

Objective

I.136. The objective is to assist, by means of international working groups, the heads of national fast breeder and HTR programmes in the co-ordination of research efforts through information exchange.

Results to date

I.137. This component, formerly part of the sub-programme entitled "Nuclear power plant technology and reliability", was initiated in 1968 with a symposium on advanced and high-temperature gas-cooled reactors and with the establishment of the International Working Group on Fast Reactors (IWGFR), consisting of representatives of Member States with large development programmes in the field of fast breeder reactor technology. IWGFR, which meets periodically for an exchange of information on the status of national programmes, has undertaken the co-ordinated international sponsorship of symposia and specialists' meetings and initiated the preparation of status reports and other technical documents; in this connection, the publication of a document containing profiles of facilities used for fast breeder research and testing is planned for this year.

I.138. IWGFR has arranged meetings of small groups of experts to discuss selected topics such as fuel failure mechanisms, decay heat removal systems, in-service inspection and monitoring, cavitation in sodium, aerosol formation, vapour deposits and sodium vapour trapping, and high-temperature structural design technology.

I.139. The great interest of many countries in the possibility of eventual full development of the HTR concept, including exploitation of the thorium fuel cycle, was reflected in a symposium held in 1975.

I.140. Consideration has been given to the setting-up of an international working group on HTRs as a means of ensuring a regular exchange of information on national research and development programmes of relevance to HTRs and as a basis for increased international co-operation in the HTR field.

Plans for 1977-78

I.141. An IWGFR-sponsored symposium on the design and construction of and operating experience with demonstration fast power reactors will be held in 1978 (Symposium - Annex III (9)).

I.142. The development of LMFBRs and the prospects for their achieving the status of a proven technology will be reviewed in 1977 (Technical Committee - Annex II (36)) and 1978 (Technical Committee). The publication of a report containing LMFBR fuel failure propagation data is planned for 1977, and specialists' meetings on specific aspects of fast reactor technology will be held in 1977 and 1978.

I.143. The status of research and development and technological progress relating to steam cycle power systems (HTGRs), advanced HTR gas turbine concepts (GT-HTRs), very high-temperature process heat reactors (VHTRs) and related systems will be reviewed in 1977 (Technical Committee - Annex II (37)) and 1978 (Technical Committee) with the assistance of an international working group on high-temperature reactors (IWGHTR) to be set up in 1977. In addition, specialists' meetings will be convened in 1977 and 1978 to consider other technological questions.

Plans for 1979-82

I.144. Advisory group and technical committee meetings on specialized topics will be held in accordance with recommendations made by IWGFR and IWGHTR. A symposium on the construction of and operating experience with prototype and demonstration HTR power installations may be held in 1979.

Advanced reactor concepts

Objective

I.145. The objective is to co-ordinate the exchange at the international level of information, on projects related to the technological development of advanced reactor concepts, including direct-cycle HTRs, VHTRs for multipurpose applications, gas-cooled fast breeders, thermal breeders, fusion reactors and advanced research/test reactors.

Results to date

I.146. In the field of fusion reactor development, a workshop on fusion reactor design problems was held at Culham in 1974 and a technical committee on the objectives and related design aspects of the next generation of large-scale Tokamak experiments was convened at Dubna in 1975. In the field of gas-cooled fast breeders (GCFRs), a study group met in Minsk in 1972 to review the reactor design studies and supporting research efforts under way in various countries. Following a consultants' meeting on thermal breeders in 1975, a status report is being issued this year.

Plans for 1977-78

I.147. With the greatly increased support being given to the development of advanced nuclear energy sources in a number of Member States, work will be intensified, particularly in connection with the development of GT-HTRs and VHTRs. One of the main problems of HTR development is the technology of reactor materials which have to withstand temperatures of 1000°C and more; the status of work in this field may be reviewed in 1978 (Advisory Group). International collaboration in the field of thermal breeders will be strengthened.

I.148. Because of the existence of large coal and lignite resources in many parts of the world, high priority is being given to the development of the technology for using nuclear heat in coal gasification; problems connected with the development of steam- and hydro-gasification processes will be reviewed in 1977 and 1978.

I.149. Selected aspects of fusion reactor technology and high-intensity neutron sources for research on fusion reactor materials will be reviewed in 1977 (Specialists' Meetings - Annex II (38 and 39)).

Plans for 1979-82

I.150. It is planned to review the rate of technological development in connection with GT-HTRs, GCFRs, thermal breeders and fusion reactors - all expanding fields - and to determine in which areas information exchange meetings may be timely. A symposium on the status of VHTR technology may be held in 1979.

Reactor physics

Objective

I.151. The objective is to collect and disseminate information on the development of experimental and analytical techniques and of related computer design codes required for a general understanding of the behaviour of reactors under normal and abnormal conditions and for the analysis of fuel burn-up, radiation shielding studies, accident analyses and studies of the effects of radiation on reactor materials.

Results to date

I.152. Agency activities in the field of reactor physics have included a seminar on numerical reactor calculations (1972), a panel on calculational techniques for determining hot channel factors in fast reactors (1973), a symposium on the physics of fast reactors

(1973), a review course on burn-up physics (1974), a technical committee meeting on neutron transport theory methods (1975) and meetings - held jointly with OECD(NEA) - on sensitivity studies and shielding benchmarks (1975) and on nuclear data requirements for shielding calculations (1976). In addition, a meeting on the development of calculational codes for the thermohydraulic analysis of containment response under assumed loss-of-coolant conditions is being held this year.

I.153. A co-ordinated research programme on selected aspects of neutron transport theory methods has been established. The co-ordinated research programme on fuel burn-up calculations and experiments for thermal reactors is being completed this year (Table I. 11, No.3).

Plans for 1977-78

I.154. Advances have been made recently in the ability to predict the transport and deposition of radiant energy in reactor systems with widely different characteristics, and the Agency will accordingly support and participate in the Fifth International Shielding Conference planned to be held in 1977 under the auspices of ERDA. An advisory group meeting on physics problems in reactor shielding is planned for 1978. Advances in Monte Carlo methods for reactor core and shielding calculations will be reviewed in 1977 (Specialists' Meeting - Annex II (40)).

I.155. Progress in the analysis of reactor behaviour under normal and abnormal operating conditions will be reviewed for purposes of information exchange, special attention being paid to the development of reactor transient codes, to the dynamic behaviour of nuclear power plants for anticipated transients without scram, to fuel-coolant interaction models for fast breeders, to the use of probability methods in reactor hazard analyses, to the physics of fuel failure propagation and to noise analysis.

I.156. Consideration will be given to the possibility of modifying the activities of the International Working Group on Reactor Radiation Measurements (IWGRRM) so that appreciably greater emphasis is placed on the problems of changes in the properties of reactor materials due to radiation damage (Technical Committee - Annex II (41)). Radiation damage units for correlating neutron damage with ion- and electron-produced damage will be reviewed in 1977 (Specialists' Meeting - Annex II (42)). Neutron spectrum unfolding codes will be reviewed in 1978 (Specialists' Meeting).

I.157. The co-ordinated research programme on methods in neutron transport theory will continue in 1977 (Table I. 11, No. 4), and it is expected that a number of contracts for research into the numerous aspects of the behaviour of reactors under normal and abnormal conditions will be awarded.

Plans for 1979-82

I.158. A seminar on numerical reactor calculation methods may be organized as a follow-up to the seminar on this subject held in 1972. In addition, a small number of meetings on selected topics concerning reactor analysis, code development, the analysis of radiation effects and shielding will be sponsored.

Advanced energy conversion

Objective

I.159. The objective is to provide for international co-operation and information exchange in connection with new developments in the field of advanced energy conversion concepts, including the use of MHD for electric power generation and the conversion of high-temperature nuclear heat into chemical binding energy (as in the production of hydrogen).

Results to date

I.160. The Joint OECD(NEA)/IAEA International Liaison Group on MHD Electrical Power Generation, established in 1966, has provided a useful international forum for periodic exchanges of information on national programmes and for international collaboration. Three international conferences on MHD electrical power generation have been sponsored jointly by the Agency and OECD(NEA); a fourth one on this subject, held in June 1975 and organized directly by various United States government agencies was supported by both international organizations. A fourth status report on work in the MHD field is being prepared by the International Liaison Group this year.

Plans for 1977-78

I.161. The International Liaison Group will meet in 1977 (Technical Committee - Annex II (43)) and 1978 to report on and evaluate new technological developments and experience gained in the operation of experimental and prototype plants.

I.162. The use of high-temperature nuclear heat in the production of hydrogen depends on the development of VHTR systems. Hydrogen is attractive as a synthetic fuel because it is easy to store, transport and distribute and because it is versatile. Accordingly, increased attention will be paid to the development of commercially viable processes for water splitting, for which temperatures in excess of 1000°C may be needed. The work being done in various countries on the development of such processes (thermochemical, electrolytic and hybrid) will be reviewed for the purpose of determining in which areas information exchange would be useful.

Plans for 1979-82

I.163. A conference on MHD electrical power generation will be held during this period if it is deemed appropriate in the light of the progress being made.

Co-operation with other organizations

I.164. Following the decision of OECD(NEA) to discontinue its activities in the MHD field, discussions of possible co-operation have been initiated with UNESCO.

International conference on nuclear power and its fuel cycle

Summary by programme components

Table I.10

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
International conference on nuclear power and its fuel cycle	-	-	-	233 000	-	-	233 000
Linguistic, printing and publishing services	-	-	-	-	-	170 000	170 000
TOTAL	-	-	-	233 000	-	170 000	403 000

Co-ordinated research programmes

Table I. 11

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. Bacterial leaching of uranium ores	6	4	1971	1976
2. Irradiation embrittlement of pressure vessel steels	-	8	1969	1976
3. Fuel burn-up calculations and experiments for thermal reactors	2	1	1971	1976
4. Methods in neutron transport theory	2	6	1972	1977

J. NUCLEAR SAFETY AND ENVIRONMENTAL PROTECTION

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table J. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	819 357	1 145 000	108 000	64 000	172 000	1 317 000	1 438 000
Consultants	62 864	142 000	3 000	(27 000)	(24 000)	118 000	148 000
Overtime	235	-	-	-	-	-	-
Temporary assistance	8 374	2 300	100	(100)	-	2 300	2 200
Sub-total	890 830	1 289 300	111 100	36 900	148 000	1 437 300	1 588 200
Common staff costs	245 172	333 900	42 000	20 100	62 100	396 000	430 800
Travel	53 705	127 400	6 000	(37 400)	(31 400)	96 000	149 000
Meetings							
Conferences, symposia, seminars	52 099	92 000	3 000	(14 000)	(11 000)	81 000	92 000
Technical committees, advisory groups	275 274	439 000	22 000	120 000	142 000	581 000	635 000
Representation and hospitality	5 551	10 400	300	-	300	10 700	11 000
Scientific and technical contracts	170 694	311 000	14 000	(40 000)	(26 000)	285 000	315 000
Scientific supplies and equipment	20 709	18 000	500	(8 500)	(8 000)	10 000	10 000
Common services, supplies and equipment	29 324	17 000	1 000	32 000	33 000	50 000	22 000
Other items of expenditure	600	-	-	-	-	-	-
Transfer of costs:							
Linguistic services	169 203	139 000	15 000	3 000	18 000	157 000	181 000
Printing and publishing services	252 466	370 000	17 000	(137 000)	(120 000)	250 000	235 000
Other programmes: PNE	-	(26 000)	(2 000)	-	(2 000)	(28 000)	(30 000)
TOTAL	2 165 627	3 121 000	229 900 7.4%	(24 900) (0.8%)	205 000 6.6%	3 326 000	3 639 000

SUMMARY OF MANPOWER

Table J. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	14	16	16	-	16	16
P-4	10	11	11	3	14	14
P-3	4	4	4	(1)	3	3
Sub-total	29	32	32	2	34	34
GS	18	24	24	1	25	25
TOTAL	47	56	56	3	59	59

CHANGES IN COSTS AND MANPOWER

Costs

J.1. As will be seen from Table J.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 $229 900 partly offset by a programme decrease of $24 900.

J.2. The programme increase of $84 100 in respect of salaries for established posts and common staff costs is due mainly to the addition of two Professional posts and one GS post and a reduction in the savings achieved through delays in recruitment.

J.3. A programme reduction of $27 000 will be possible in respect of consultants' services and of $37 400 in respect of travel since it is foreseen that the requirements will be less than estimated for 1976.

J.4. It is planned to hold in 1977 one seminar less than the number included in the 1976 budget so that there will be a programme reduction of $14 000. The programme increase of $120 000 in respect of technical committees and advisory groups is due to a larger number of meetings being planned for 1977.

J.5. A programme reduction of $40 000 will be possible in respect of scientific and technical contracts, mainly in the "Waste management" sub-programme. Scientific supplies and equipment will have to be purchased in 1977, for instance surface contamination monitors, alpha detectors, protective clothing, and films for personnel monitoring, but the total requirement will be lower than budgeted for 1976 so that a programme reduction of $8500 can be foreseen.

J.6. A programme increase of $32 000 is expected in respect of common services, supplies and equipment. It is planned to produce a training film on effluent monitoring techniques for airborne and liquid releases, and to rent a video and tape typewriter to deal with the heavy work load of routine correspondence relating to the programme on nuclear safety standards and other related items in the sub-programme.

J.7. A programme reduction of $137 000 is foreseen in respect of printing and publishing services, since it is expected that the requirements of all three sub-programmes, in particular those of the "Nuclear safety" sub-programme, will be lower than estimated in the 1976 budget. A small programme increase of $3000 is foreseen in respect of linguistic services.

Manpower

J.8. As will be seen from Table J.2 above, the up-grading of one Professional post and the addition of two Professional posts and one GS post is foreseen for 1977.

J.9. Following the recommendations of a manpower survey, an existing Professional post in the "Radiological safety" sub-programme will be reclassified from the P-3 to the P-4 level to take proper account of the responsibilities attached to this post and the high level of competence and experience required in the field of operational radiological safety in the nuclear fuel cycle and nuclear accident dosimetry. In the same sub-programme the addition of a P-4 post is required for a staff member to co-operate in the joint IAEA/IIASA research project on risk assessment. An additional GS post for a research technician will be required to support the joint project.

J.10. In the "Waste management" sub-programme one additional P-4 staff member will be needed to cope with the increased work load in handling information from the "Study on regional nuclear fuel cycle centres" and in the integration of the Agency's work on radioactive wastes in geological formations with other activities related to the management of radioactive wastes.

THE PROGRAMME

OBJECTIVE

J. 11. 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

J. 12. This programme consists of four sub-programmes, which are dealt with separately below.

Summary of manpower and costs by sub-programme

Table J. 3

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years P	Man-years GS	Costs	Man-years P	Man-years GS	Costs
Radiological safety	13,4[a/]	12,4	1 178 000	13,4	12,4	1 177 000
Waste management	10,3[a/]	5,3	1 045 000	10,3	5,3	1 163 000
Nuclear safety	10,3	7,3	1 103 000	10,3	7,3	1 299 000
TOTAL	34,0	25,0	3 326 000	34,0	25,0	3 639 000

a/ In order to take account of changing requirements within the programme, internal transfers of posts were made in 1976 which resulted in an increase of one post for the "Radiological safety" sub-programme and a corresponding reduction for the "Waste management" sub-programme.

SUB-PROGRAMMES

Radiological safety

OBJECTIVE

J. 13. The objective is to provide safety standards, recommendations, guidance, assistance and services to Member States aimed at ensuring the protection of man, his property and the environment against any possible harmful effects of radiation arising in the expanding nuclear industry.

PLANS FOR 1977-82

J. 14. Work will continue on the following six basic topics:

(a) The preparation and bringing up to date of radiological safety standards and recommendations for the radiological protection of workers, the general public and the human environment;

(b) The provision of assistance to Member States in applying these standards and recommendations, and in training their specialists and technicians;

(c) Risk assessment and its relationship to decision-making;

(d) The dissemination of information on radiation protection methods, procedures and instrumentation;

(e) The promotion and co-ordination of research related to radiological protection; and

(f) The provision of radiological protection services for the Agency's laboratories and for staff who may be exposed to radiation in the course of their work.

J. 15. In recent years the main emphasis has gradually shifted from the first topic to the other five topics. This shift is expected to continue, but existing standards and recommendations will be brought up to date and new topics will be introduced as the need arises.

J. 16. Where appropriate, an attempt will be made to secure the joint preparation and endorsement of these standards and recommendations by other competent international organizations, in particular WHO. Efforts will also be made to ensure the harmonization of the standards with other international standards and to encourage Member States to adopt them to the greatest possible extent.

J. 17. Activities directly related to the development of nuclear power programmes will continue to grow and other activities of lower priority may be curtailed. The expansion of the work related to nuclear power, and the provision of radiological protection services for the increasing number of Agency safeguards inspectors and for the Safeguards Analytical Laboratory and other Agency laboratories, will continue.

STRUCTURE

J. 18. This sub-programme consists of seven components, which are described in the following paragraphs.

Radiological safety

Summary by programme components

Table J. 4

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Radiological safety standards	2.0	1.0	96 100	51 000	30 000	3 200	180 300
Radiological protection of workers	3.0	1.4	134 700	40 000	25 000	3 500	203 200
Radiological protection of the general public and the environment	3.0	1.4	130 600	72 000	30 000	5 100	237 700
Joint IAEA/IIASA research project on risk assessment	1.0[a]	4.0	82 200	18 000	40 000	3 700	143 900
Radiological safety features of nuclear facilities	2.0	1.1	95 900	18 000	10 000	2 300	126 200
Radiological protection services for the Agency's laboratories and staff	1.8	3.2	109 700	-	-	30 000	139 700
Emergency assistance in the event of radiation accidents	0.6	0.3	30 000	-	-	-	30 000
Linguistic, printing and publishing services						145 000	145 000
Transfers to other programmes for direct support						(28 000)	(28 000)
TOTAL	13.4	12.4	679 200	199 000	135 000	164 800	1 178 000

a/ The total professional manpower allocated to this component is about nine and includes an Agency staff member from outside the programme, staff members of IIASA and experts seconded by Member States

Radiological safety standards

Objective

J. 19. The objective is to prepare and bring up to date, as necessary, safety standards for the protection of health and minimization of risk to life and property from the effects of ionizing radiation and to promote the harmonization of existing standards.

Results to date

J. 20. This component was initiated in 1958. The Agency's safety standards comprise basic safety standards for radiation protection, specialized regulations and codes of practice which are approved by the Board of Governors and are mandatory for the Agency's own work and for work in Member States for which the Agency provides assistance. They are also recommended for adoption by Member States and international organization. These safety standards are defined and their mode of application prescribed in the Agency's Safety Standards and Measures [J. 1]. By 1975 seven publications containing standards relating to radiological safety had been issued.

J. 21. In the period 1970-75, the Code of Practice on the Safe Handling of Radionuclides was revised. The Regulations for the Safe Transport of Radioactive Matierals also underwent a comprehensive revision and were issued in 1973 as the 1973 Revised Edition. These regulations have now been adopted by virtually all the international organizations concerned with the transport of goods and by most Member States. A companion volume of advisory material on the application of the Agency's transport regulations was also published in 1973. This advisory material will be brought up to date at intervals of about two and a half years. In addition, the proceedings of a symposium and a seminar have been published.

Plans for 1977-78

J. 22. The Basic Safety Standards for Radiation Protection will be revised in 1977 (Advisory Group - Annex II (44)) and 1978 in collaboration with WHO, ILO and OECD(NEA). This revision, which was originally planned for 1975-76, has been delayed pending the issue of the revised recommendations of ICRP, which is now expected to be in 1977. Other components of the Agency's safety standards that will be brought up to date are the Code of Practice on Basic Requirements for Personnel Monitoring, in 1977 (Advisory Group - Annex II (45)) and the Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores, in 1978 (Advisory Groups).

J. 23. When the current version of the Agency's Regulations for the Safe Transport of Radioactive Materials were approved by the Board of Governors in 1972, it was stated that it was foreseen by the Secretariat that another major review of the regulations would not be required until ten years had elapsed, but that Member States would be asked after five years whether an earlier review would be desirable. An enquiry to this effect will therefore be addressed to all Member States and to the international transport organizations that have adopted the Agency's regulations. Attention will also be given to special problems in the application of the regulations to the transport of irradiated fuel. In response to requests from international organizations, a study will be made in collaboration with the Legal Division on the need for, and desirability of, establishing an international convention covering the safe transport of radioactive materials by all modes of transport, possibly as part of a broader convention covering the transport of all dangerous goods. A study will also be made of the possibility of establishing an international convention covering the physical protection of nuclear material during transport. Advisory services will be provided on the interpretation and implementation of radiological safety standards. The Agency's safety standards will continue to be applied to Agency-assisted projects, and health and safety advisory and inspection missions will be sent, as required, to Member States that have concluded agreements with the Agency on assisted projects.

[J. 1] INFCIRC/18/Rev.1.

J. 24. Research will be supported on performance tests for transport packaging and a co-ordinated research programme is envisaged.

Plans for 1979-82

J. 25. Existing radiological safety standards will be brought up to date as required and new standards will be prepared as the need arises. The next major review of the Agency's transport regulations will be undertaken about 1980. The advisory material on the application of the transport regulations will be brought up to date at intervals of about two and a half years, and up-to-date lists of national competent authorities will be issued annually. Attention will also be given to the transport of irradiated nuclear fuel and high-level radioactive wastes.

J. 26. In collaboration with the Legal Division, advice will continue to be given through regional seminars and advisory services on the harmonization of national legislation and standards for radiological protection.

J. 27. The Agency's safety standards will continue to be applied to Agency-assisted projects and health and safety advisory and inspection missions will be sent as required to facilities in Member States that have concluded agreements with the Agency.

Co-operation with other organizations

J. 28. This component involves co-operation with ILO, WHO, ICAO, IMCO, UPU, ECE, ICRP, ICRU, ISO, IATA, OECD(NEA) and the Central Office for International Railway Traffic.

Radiological protection of workers

Objective

J. 29. The objective is to provide recommendations and guidance on measures for the radiological protection of occupationally exposed persons, on the provision of adequate physical and medical surveillance, and on the assessment of occupational exposure.

Results to date

J. 30. This component was initiated in 1958. The work has resulted in the publication of recommendations and guidance to Member States on the organization of radiation protection programmes, on the safe operation of facilities and the safe handling of radioactive materials, on physical and medical surveillance of workers, including personnel and area monitoring, on protective clothing and devices, on emergency plans and procedures, and on the handling of radiation accidents and the diagnosis and treatment of radiation injury to workers.

J. 31. In the period 1970-75 the proceedings of three symposia and seminars were published and five volumes were issued in the Safety Series and Technical Reports Series. Five regional training courses and five regional study group meetings included the radiological protection of workers as substantial parts of their programmes, and lectures were given at many training courses, dealing primarily with broader topics, which were arranged by other Divisions of the Agency and by other organizations. Advice on protective measures was also given on request to institutes in Member States.

Plans for 1977-78

J. 32. A manual of guidance will be prepared, with the help of a consultant, on the monitoring of workers for internal contamination. Recommendations will be drawn up on safe handling procedures for transuranium elements and for tritium, and on the radiological safety aspects of the operation of selected types of betatrons.

J. 33. The special radiological safety aspects of the use of plutonium as nuclear fuel will be studied in 1977 (Advisory Group - Annex II (46)). A manual of guidance will also be prepared on the handling of persons involved in radiation accidents and on the preparation of emergency plans for nuclear facilities (Advisory Group - Annex II (49)). In collaboration with the Nuclear Safety Section an international symposium will be organized on the handling of radiation accidents (Symposium - Annex I (24)). This meeting will include sessions on "on-site" and "off-site" emergency plans for nuclear power plants. Studies will continue on the means by which the Agency might assist developing Member States, on request, in transporting spent fuel elements to reprocessing plants or storage sites in other countries. Work will continue, if possible in collaboration with UNSCEAR, on the collection of information on the radiation doses received by workers with the aim of assessing with greater precision the contribution that occupational exposure makes to the collective dose to the population (with the help of a consultant).

J. 34. A review will be made in 1978 of recent advances in the methods and techniques of radiation monitoring for protection purposes (Symposium - Annex III (10)). Regional seminars will continue to be convened at appropriate locations to discuss, among other topics, the radiological protection of workers. Research will be supported on topics related to the radiological protection of workers. These will include a co-ordinated research project on determination of plutonium body burdens.

J. 35. Subject to the availability of funds, regional training courses dealing, among other topics, with the radiological protection of workers, will be held, and a study tour will take place in which selected participants from developing countries will be able to observe and discuss well organized radiation protection services and procedures in Member States that have highly developed nuclear programmes.

Plans for 1979-82

J. 36. Attention will continue to be given to the special radiation protection problem arising in the handling of such radioactive substances as the transuranium elements and tritium. Efforts will also be made to encourage the strict implementation of recommended radiation protection measures in order to reduce the contribution of occupational exposure to the collective dose to the population. Emphasis will be placed on the organization of regional seminars and training courses and on the provision of advisory services.

Co-operation with other organizations

J. 37. This component involves co-operation with ILO, WHO, UNSCEAR, ICRP and OECD(NEA).

Radiological protection of the general public and the environment

Objective

J. 38. The objective is to provide recommendations and guidance on measures for the radiological protection of the general public and the environment, on the provision of adequate environmental surveillance, and on the assessment of collective doses to the population.

Results to date

J. 39. This component was initiated in 1958. The work has resulted in the publication of recommendations and guidance to Member States on the organization of operational radiation programmes for the public and the environment, on environmental monitoring programmes for normal operation and for emergency situations, on the establishment of authorized discharge limits for radioactive contaminants, on emergency plans and procedures, and on the handling of accidents that might involve exposure of the public.

J. 40. In the period 1970-75 the proceedings of three symposia and seminars were published and five volumes were issued in the Safety Series and Technical Reports Series. Five regional training courses and five regional study group meetings included the radiological protection of the general public and the environment as substantial parts of their programmes, and lectures were given at training courses on broader topics arranged by other Divisions of the Agency and by other organizations. Advice on environmental monitoring was also given on request to institutes in Member States.

Plans for 1977-78

J. 41. The monitoring of airborne and liquid releases of radioactive materials from nuclear facilities is an essential measure for ensuring compliance with the authorized discharge limits. An advisory group prepared recommendations on this topic in 1975 and it is planned to review experience in 1977 and discuss the implementation of such recommendations (Symposium - Annex I (22)). In collaboration with WHO and with the financial support of UNEP, studies will be made on the contributions of the transport of radioactive materials and the mining and milling of radioactive ores to the collective dose to the population, and on the non-radioactive contaminants released to the environment from the nuclear industry (with the help of consultants). Work will also continue, in co-operation with the Waste Management Section, on procedures for establishing authorized discharge limits for radioactive contaminants (Advisory Group - Annex II (56)). In all the activities relating to radiological protection of man close co-operation is maintained with UNSCEAR.

J. 42. The study on questions of mutual co-operation between countries in the Danube catchment area in matters relating to the radiological safety aspects of nuclear programmes, started in 1975, will be continued in 1977 (Advisory Group - Annex II (47)) and possibly in 1978. The first phase of this project involves the establishment of a co-ordinated research programme. Information will also be collected and presented in a systematic manner on the radiological impacts on man and the environment of selected important radionuclides (with the help of a consultant).

J. 43. The preparation, jointly with the Legal Division, of recommendations on procedures to be followed in the event of the accidental release of radioactive material during transport by sea, or by land, air or inland waterways, originally planned for 1976, has been deferred until 1977 (Advisory Group - Annex II (48)) and may be continued in 1978. The guidance on the preparation of emergency plans for nuclear facilities referred to in paragraph J. 33 above (Advisory Group - Annex II (49)) will also cover plans for the protection of the public in the event of radiation accidents. Regional seminars will continue to be convened at appropriate lcoations to discuss, among other topics, the radiological protection of the general public and the environment, and research on topics related to that subject will be supported. About twenty research contracts and agreements will be included in two co-ordinated research programmes on environmental monitoring for radiation protection purposes carried out with the participation of institutes in South East Asia and in Latin America, respectively (Table J. 7, Nos 1 and 2).

Related activities

J. 44. Subject to the availability of funds, regional training courses on plans and procedures for handling emergency situations will be organized at appropriate locations.

Plans for 1979-82

J. 45. Special attention will be given to the practical methods for establishing authorized discharge limits for radioactive contaminants, to the organization of effluent and enivronment monitoring systems for ensuring compliance with these limits, and to measures for protecting the public in the event of radiation accidents. Emphasis will also be placed on the organization of regional seminars and training courses and on the provision of advisory services.

Co-operation with other organizations

J. 46. This component involves co-operation with WHO, FAO, UNSCEAR, UNEP, ICRP and OECD(NEA).

Joint IAEA/IIASA research project on risk assessment

Objective

J. 47. This research is directed towards gaining an improved understanding of how societies judge the acceptability of new technologies and how objective information on risks, and the anticipated responses to them, may be considered in decision-making. The emphasis is on the risk aspects of energy systems, with nuclear energy serving as an excellent case study.

Results to date

J. 48. This joint project on risk assessment was established in 1974; the staff consists of Agency and IIASA professionals and is augmented by scientists seconded cost-free to the Agency by interested Member States.

J. 49. The results of the research are being published primarily through the IIASA Report publications system and in appropriate professional journals. Occasional summary articles are published in the IAEA Bulletin. To date, 21 reports and papers presenting preliminary results have been published.

J. 50. In 1975 an advisory group meeting on the public acceptance of nuclear power was held. This meeting brought together nuclear technicians, public information officers and social-behavioural scientists actively involved in research in areas related to the public acceptance of technological development. This composition of the advisory group provided new insights into questions of public acceptance and will be considered for future such meetings.

Plans for 1977-78

J. 51. In the period 1977-78 the research programme will concentrate upon continuing studies on the cost effectiveness of safety systems, on methodologies for evaluating projects which affect human mortality, on surveys to determine public attitudes towards various technologies and the identification and relative importance of the factors which shape these attitudes. Research will also continue on the role of the news media in influencing public opinion and the social dynamics of the actions of interested groups with respect to technological developments. A publication which integrates research results in these various areas will be completed early in this period. It is expected that the advisory group meetings on the public acceptance of nuclear power will be continued (Advisory Group - Annex II (50)).

J. 52. The Agency will co-operate with IIASA and WHO on a UNEP-funded project entitled "Comparison of Energy Options: A Methodological Study". It is expected that about 80% of the Agency's activities in support of this project will be carried out within the framework of the joint project. Research on various aspects of risk assessment will be supported. It is expected that a co-ordinated research programme on risk assessment will be started in 1977. It will be necessary to recruit an additional Professional staff member and a research technician at the GS level in 1977 for work on the joint project.

Plans for 1979-82

J. 53. The emphasis in this period is expected to shift in the direction of obtaining empirical results to combine the theoretical and methodological results derived earlier.

Radiological safety features of nuclear facilities

Objective

J. 54. The objective is to provide recommendations and guidance on radiological safety features of the design and operation of nuclear facilities including fuel fabrication plants, nuclear reactors, fuel reprocessing plants, laboratories and other facilities for the storage and handling of radiation sources.

Results to date

J. 55. This component was initiated in 1965. The work has resulted in the publication of recommendations and guidance on radiological safety aspects of the design and equipment of "hot" laboratories, on the safety analysis of laboratories handling radioactive substances of high activity and of high radiotoxicity, and on the design and operation of devices for limiting and for monitoring releases of radioactive substances from nuclear facilities.

J. 56. In the period 1970-75, the proceedings of a symposium were published, and a manual was issued in the Safety Series. Guidance was prepared on radiological protection services for nuclear power plants and for fuel fabrication plants. Advisory services were provided for Member States in connection with irradiation facilities, radioisotope production and handling laboratories and fuel fabrication plants.

Plans for 1977-78

J. 57. The efficient functioning of the ventilation and air cleaning systems is of the utmost importance in all nuclear facilities, and a manual of practical guidance will be prepared in 1977 on the design, choice of constructional materials, maintenance and testing of ventilation and air-filtering systems (Advisory Group - Annex II (51)). Work will continue on the provision of guidance on the preparation and review of safety analyses of "hot" laboratories and on radiological safety aspects of the design and operation of nuclear facilities, including fuel fabrication plants, reactors, fuel reprocessing plants, and the associated laboratories. Advisory services related to such facilities will continue to be provided, on request, for Member States.

J. 58. In continuation of the comprehensive programme on radiological safety in the nuclear fuel cycle, the preparation of a manual of guidance will be started in 1978 on radiological protection services for fuel reprocessing plants (Advisory Group). The participation of staff in health and safety advisory missions to Member States is expected to continue to increase in 1977 and 1978. The staff will also participate in the preparation of some of the safety guides included in the nulcear safety standards programme. It is expected that a small number of research contracts related to the radiological safety assessment of containment and ventilation systems for laboratories and other facilities will be concluded in this period.

Related activities

J. 59. Subject to the availability of funds, a regional training course dealing with, among other topics, the radiological safety features of nuclear facilities, will be organized at an appropriate location, and a group scientific visit to countries with advanced nuclear programmes will be organized for selected senior technical staff from developing countries that have embarked on nuclear power programmes.

Plans for 1979-82

J. 60. Attention will continue to be given to the radiological safety aspects of the design and operation of facilities for handling transuranium elements and of facilities in the nuclear fuel cycle. Emphasis will be placed on the organization of regional seminars and training courses and on the provision of advisory services.

Co-operation with other organizations

J.61. This component involves co-operation with ILO, WHO and OECD(NEA).

Radiological protection services for the Agency's laboratories and staff

Objective

J.62. The objective is to provide adequate radiological protection services for the Agency's laboratories and for staff who may be exposed to radiation in the course of their work.

Results to date

J.63. This component was initiated in 1963. Radiological protection rules and procedures, based on the Agency's safety standards, for all work by Agency staff members and technical assistance experts which may involve exposure to radiation, were established and kept up to date as part of the work under this component. The formulation and bringing up to date of the rules and procedures is now the task of the Interdepartmental Radiation Protection Committee, for which advice continues to be provided. The Radiation Health and Safety Officer and the health physicists and technicians required under the radiological protection rules and procedures for the Agency's laboratories, including the Safeguards Analytical Laboratory, are drawn from the staff of the Radiological Safety Section.

J.64. In the period 1970-75, personnel monitoring services for external radiation and bio-assay and whole-body monitoring services were arranged for staff of the Seibersdorf, Monaco and Headquarters Laboratories for safeguards inspectors and for other staff. Radiation surveillance was provided on a continuous basis at the Agency's Seibersdorf Laboratory. Advice was given on radiological protection aspects of the design and construction of the Safeguards Analytical Laboratory at Seibersdorf and a consultant was engaged to review the current plans and procedures. Arrangements were made to provide suitable medical care for any staff members who may be involved in radiation accidents. A small stock of special instruments is maintained in good working order for use in emergency situations. The safety analysis report of the Laboratory has been reviewed and assistance and advice has been provided during the commissioning investigation.

Plans for 1977-78

J.65. The Radiological Safety Section will continue to provide the Radiation Health and Safety Officer and the health physicists and technicians for the Seibersdorf Laboratory, including the Safeguards Analytical Laboratory. The Radiation Health and Safety Officer and the health physicists will continue to perform the duties assigned to them under the Agency's radiological protection rules and procedures. Personnel monitoring services, training and instruction will be provided as required for staff in the Agency's laboratories at Seibersdorf, Monaco and Headquarters, and for safeguards inspectors, other staff and technical assistance experts who may be exposed to radiation in the course of their work. Day-by-day radiation and contamination monitoring services will be provided at the Seibersdorf laboratories, and the necessary records will be maintained of all personnel monitoring and other physical surveillance procedures. The stock of monitoring and testing instruments and protective equipment and supplies will be kept up to date and extended as required; all instruments, protective clothing, equipment and supplies will be checked periodically. In 1977 the operational radiological protection measures at the Safeguards Analytical Laboratory will be reviewed (with the help of a consultant).

Related activities

J.66. The Agency's laboratories at Seibersdorf and at Headquarters will continue to provide bio-assay and whole-body monitoring services for occupationally exposed staff. At present about 200 bio-assay and about 200 whole-body monitoring assessments are

performed per year. The Seibersdorf Laboratory will also provide technical services for any environmental monitoring required.

Plans for 1979-82

J. 67. The work under this component will continue and will be modified and extended as necessary to meet the needs of the expanding safeguards inspectorate and the laboratory programmes. It is expected that the workload will continue to increase and a need for additional staff and equipment is foreseen.

Emergency assistance in the event of radiation accidents

Objective

J. 68. The objective is to help Member States to obtain any additional emergency assistance they may require in the event of serious radiation accidents.

Results to date

J. 69. This component was initiated in 1961. 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) has been prepared, in collaboration with ILO, WHO and FAO, and distributed to all Member States, which outlines the nature of the emergency assistance that Member States might be willing to make available on request and which indicates the preferred channels of communication. This document is brought up to date periodically. 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 in co-operation with the Legal Division. The Agency is prepared to act, on request, as an intermediary and if necessary to send staff members to the site of an accident.

J. 70. In the period 1970-75, Document WP/35 was brought up to date and tests of the smooth working of the system for alerting and sending Agency staff to the site of an accident in response to a request at any time were made frequently. A consultant also reviewed the system and drew up recommendations for its improvement. Replacement and additional items of equipment were added, as required, to the stock held in readiness for use in an emergency and new staff members were given instructions concerning their possible role in providing emergency assistance. Attempts were made to encourage the conclusion between Member States of multilateral regional or other agreements for the provision of mutual emergency assistance. Two regional training courses on plans and procedures for handling radiation emergencies included field exercises based on a variety of simulated accident situations.

Plans for 1977-78

J. 71. The emergency assistance system will be maintained and tests of the smooth working of the Agency's response to simulated requests will be made periodically as in the past. The emergency manual will be brought up to date and extended as required. The document which outlines the nature of the emergency assistance that Member States might be willing to make available on request will be brought up to date, if possible in collaboration with ILO, WHO and FAO. Newly appointed staff members will be given instruction concerning their possible role in the emergency assistance system. Replacement items and additional items will be added, as required, to the stock of instruments and equipment held ready for use in an emergency and all items will be checked at regular intervals. Member States will be encouraged to enter into bilateral, multilateral, regional or other agreements for the provision of mutual emergency assistance. A review of the Agency's emergency assistance system will be made by an outside expert in 1978.

Related activities

J. 72. Radiochemical analysis of environmental samples and bio-assay measurements can be performed in the Agency's Laboratory as a contribution to the emergency assistance offered to Member States. The staff of other Divisions who have appropriate specialized knowledge or experience are listed and can take part in meeting the response to a request for advice or assistance.

Plans for 1979-82

J. 73. The emergency assistance system will be developed and extended as appropriate and tests of the Agency's response to simulated requests for assistance will be made from time to time. The instruments and equipment held in stock will be reviewed and replaced as required.

Co-operation with other organizations

J. 74. This component involves co-operation with ILO, WHO and FAO in the collection and distribution of information and in the provision of assistance when required.

Waste management

OBJECTIVE

J. 75. The objective is to review the management of wastes arising in the peaceful uses of nuclear energy, with particular emphasis on the nuclear fuel cycle and the problem of safe, long-term storage and disposal of the wastes; to develop and review techniques for maintaining releases of radionuclides and other contaminants from the nuclear industry at acceptable levels, assess the consequences of actual releases and evaluate the potential impact on the environment; and to develop and disseminate information and to advise Member States on the methods of safe management of radioactive wastes.

PLANS FOR 1977-82

J. 76. The Agency will continue to provide a forum for discussing the future needs of waste management in Member States and to encourage useful research in that area. Information on developed techniques and the state-of-the-art will be disseminated through symposia, technical reports, guide-books and advisory missions. Efforts will be continued to develop suitable treatment and disposal methods especially for high-level and alpha-bearing waste, with emphasis on the use of geological formations and on the development of the technology for alternative disposal methods.

J. 77. The activities will include further studies on the behaviour and fate of radionuclides and other contaminants released to the environment and on the consequences of such releases with a view to establishing safe limits for them. Meetings of experts will be convened to assess the magnitude of the risk of the continued release of tritium and the radioactive noble gases with the objective of developing techniques to remove and store or dispose of these radionuclides.

J. 78. Guidance on and planning for the decommissioning of nuclear facilities will become a more important activity.

STRUCTURE

J. 79. This sub-programme consists of three components, which are described in the following paragraphs.

Waste management

Summary by programme components

Table J. 5

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Treatment and disposal of radioactive wastes	5.0	2.6	258 900	79 000	80 000	10 000	427 900
Nuclear energy and environmental impact	4.8	2.4	246 600	92 000	70 000	9 300	417 900
Decommissioning of nuclear facilities	0.5	0.3	26 000	12 000	-	1 200	39 200
Linguistic, printing and publishing services	-	-	-	-	-	160 000	160 000
TOTAL	10.3	5.3	531 500	183 000	150 000	180 500	1 045 000

Treatment and disposal of radioactive wastes

Objective

J. 80. The objective is to review, evaluate and disseminate information on waste management technology, procedures and practices; to develop standards of safety for the treatment and disposal of wastes aimed at ensuring the long-term protection of the public and the environment; and to encourage the development and use of appropriate waste management practices.

Results to date

J. 81. This component was initiated in 1958. Methods for the treatment and disposal of low- and intermediate-level radioactive wastes have been reviewed and information on these methods has been made available to Member States. In the last six years one guide-book has been published in the Safety Series and four in the Technical Reports Series. Since 1965, the Agency has also published ten volumes of abstracts on waste management research.

J. 82. Management policies and practices for high-level and alpha-bearing wastes vary from country to country because of different conditions, but there is need for harmonization of the principles on which policies and practices should be based. A central review of the policies and methods employed in the management of low- and intermediate-level wastes was made at a symposium in 1970, jointly sponsored by the Agency and OECD(NEA), and a similar review in the case of wastes from nuclear fuel reprocessing was made at a symposium in 1972, also jointly organized by the Agency and OECD(NEA). The proceedings of both of these symposia have been published. A follow-up symposium has been held this year on the management of radioactive wastes from the nuclear fuel cycle which has also been jointly organized by the Agency and OECD(NEA).

J. 83. A technical committee was established and met in 1974, 1975 and 1976 to exchange information on the management of high-level and alpha-bearing wastes.

J. 84. Panels were convened in 1972 and 1974 to prepare guidelines on the choice of burial conditions for low- and intermediate-level radioactive waste concentrates which have been incorporated in bitumen or concrete. It is planned to publish the results of these panel meetings as a Technical Report.

J. 85. Two consultants' meetings in 1974 and 1975 have resulted in the preparation of a draft guide on factors in selecting sites for the disposal of solidified high-level and alpha-bearing wastes in geological formations. This draft was reviewed and modified by an advisory group and the result is being published as a Technical Report this year.

J. 86. Work has been done in the preparation of manuals of guidance on the technology for the management of radioactive wastes and materials arising from the operation of nuclear power reactors by two advisory groups during 1975: first, guidelines on the management of radioactive wastes at nuclear power plants that would up-date and expand a manual prepared in 1968; secondly, guidelines on the safe storage, handling and on-site transporation of irradiated fuel and components at reactor plants, taking into account the extended periods of time over which such materials may be stored due to a lack of fuel reprocessing capacity.

Plans for 1977-78

J. 87. Plans are being made to replace the technical committee on high-level and alpha-bearing wastes by a number of more specialized advisory groups which will meet during 1977-78. These will carry out, in 1977, a review of the techniques available for the solidification of high-level radioactive wastes (Advisory Group - Annex II (52)) and in 1978, a review of geological formations for disposal and of the characteristics of solidified high-level waste products (Advisory Group) and the increasing problem of the management of alpha-contaminated wastes (Advisory Group).

J. 88. Work will continue in 1977 on the assessment of the waste management problems at nuclear power stations (Advisory Group - Annex II (53)) and also the handling of irradiated fuel (Advisory Group - Annex II (54)). Due to the increasing number of Member States embarking on nuclear power programmes and also because of the new technologies involved with breeder reactors, the problems of decontamination will be reviewed in 1978 (Advisory Group) together with the waste management problems at fuel fabrication facilities (Advisory Group).

J. 89. Attention will also be given in 1978 to the increasing problem of the management of mill tailings that arise from uranium mining (Advisory Group). An additional staff member to be recruited in 1977 will be engaged primarily in work related to the treatment and disposal of radioactive wastes.

J. 90. Research on various aspects of waste disposal, particularly waste forms and their effects on geological formations, the possibility of quantitative separation of the actinides from the nuclear wastes and the problems involving a "throw-away" spent fuel concept will be supported.

Plans for 1979-82

J. 91. Guidance and other assistance will be provided on the selection and operation of waste management programmes and facilities appropriate to the individual needs of Member States, recognizing the special needs of those countries with developing nuclear power programmes. Special efforts will continue on developing suitable treatment and disposal methods for high-level and alpha-bearing waste.

J. 92. The handling, storage and disposal of the contaminated fuel hulls from the re-processing of irradiated fuel will be reviewed with a view to recommending a suitable course of action for the future.

J. 93. With the increasing use of fast-breeder reactors, the problem of the management of wastes arising from the use of such reactors and the effect on the total fuel cycle will be studied.

J. 94. Attention will also be given to the management of tritium and radioactive noble gases with the operation of an increasing number of spent fuel reprocessing plants and of high-temperature, gas-cooled reactors. The possible removal, storage and disposal of the gaseous radionuclides will be encouraged.

J. 95. Continuing efforts will be made to secure international co-operation in the harmonization of principles and the review of national policies of waste management. The implications for waste management of the Regional Nuclear Fuel Cycle Centres Study Project will be taken into account. Two items will be of particular concern, namely the management systems that involve the release of radionuclides which may go beyond national boundaries and the management of wastes that require safe containment for long periods of time. The problem of environmental contamination by long-lived radionuclides such as the actinides or ^{14}C must also be investigated.

J. 96. The waste management aspects of fusion power programmes must be considered well in advance of the first demonstration fusion reactor.

Co-operation with other organizations

J. 97. This component involves co-operation with WHO, WMO, UNEP, CMEA, OECD(NEA) and the Commission of the European Communities in regard to joint sponsorship of conferences, meetings and advisory groups, and in the publication of reports.

Nuclear energy and environmental impact

Objective

J. 98. The objective is to evaluate the potential impact on man - and other sensitive organisms - of ionizing radiation, radioactive materials and other related stresses arising from the applications of nuclear energy; to develop analytical techniques suitable for the assessment and formulation of national and global waste management policies and practices; to develop methods for establishing authorized discharge limits for radioactive and non-radioactive contaminants from nuclear activities; and to support research on the behaviour of radionuclides in the environment, including their transfer through food and other ecological chains.

Results to date

J. 99. This work became a separate component in 1972. Four symposia were held in the period 1972-74 on the following topics:

(a) Radioactive contamination of the marine environment;

(b) Environmental behaviour of radionuclides released in the nuclear industry;

(c) Physical behaviour of radioactive contaminants in the atmosphere; and

(d) Environmental impact of condenser cooling systems and thermal discharges at nuclear power stations.

J. 100. Three books were issued in the Safety Series and three in the Technical Reports Series during this period.

J. 101. As a part of the programme on environmental contamination three symposia were held in 1975 on the following topics:

(a) Combined effects of radioactive, chemical and thermal releases to the environment;

(b) Impacts of nuclear releases into the aquatic environment; and

(c) Transuranium nuclides in the environment.

J. 102. The investigations and the results that were reported showed that the convening of the symposium on the first subject was premature and further meetings will be required on the same subject in the next few years.

J. 103. As a result of the United Nations Conference on the Human Environment held in Stockholm, a conference was held in London in 1972 which adopted a Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention) [J. 2] under which the Agency was given the responsibility to define criteria and standards for dealing with the question of sea disposal of radioactive wastes.

J. 104. With a view to the fulfilment by the Agency of its responsibilities under the Convention, a number of panel and consultants' meetings were held during the next two years, culminating in a Provisional Definition and Recommendations [J. 3] which, in December 1974, the Director General communicated to the United Kingdom which is performing secretariat duties under the Convention. An Advisory Group on Oceanographic Modelling was convened in 1975, but owing to the problems of understanding the phenomena occurring in the deep sea, further meetings will be required before further recommendations can be made about the dumping of radioactive wastes into the sea. An advisory group meeting held in May 1976 considered environmental capacity and especially procedures for establishing limits for the release of radioactive material into the environment. An advisory group will deal with the Agency's responsibilities under the London Convention in November 1976.

J. 105. Increased efforts are being made this year to understand the synergistic effects of radioactive and thermal discharges on a large scale and an advisory group will meet to prepare a methodology for assessment of radioactive, non-radioactive and thermal discharges and disposals on a regional and global basis.

Plans for 1977-78

J. 106. The study of the environmental impacts of the nuclear power industry, taking into account the waste production and environmental disturbances associated with each phase of the nuclear power cycle will be accelerated, primarily for developing countries (Seminar - Annex I (23)).

J. 107. The first symposium on tritium was organized by the Agency in 1961. A number of small meetings have been held since, but with the increasing construction of light- and heavy-water reactors, the potential international and environmental problems will be reviewed in 1978 (Symposium - Annex III (11)).

J. 108. The Agency's responsibilities and definitions under the London Convention will continue to be reviewed in 1977 (Advisory Group - Annex II (55)).

J. 109. The procedures for establishing limits for releases of radioactive materials to the environment will be further developed in 1977 with the intention of preparing a set of agreed recommendations in 1978 (Advisory Group - Annex II (56)). The distribution and transport of actinides in the marine environment will be studied in 1978 (Advisory Group) and the more general problem of the disposal of radioactive wastes in the sea will be reviewed (Advisory Group) with particular reference to disposal of waste on or under the sea bed. The application of cost/risk/benefit analysis in the environmental and waste management fields will be reviewed in 1978 (Advisory Group).

[J. 2] The text of the Convention is reproduced in document INFCIRC/205.

[J. 3] INFCIRC/205/Add. 1.

J. 110. Research will be co-ordinated in the following fields:

(a) Dispersion of radionuclides from the storage of radioactive wastes under various conditions in the terrestrial environment (Table J. 7, No. 6);

(b) Study of integrated radioactive waste management systems and their impact on the environment (Table J. 7, No. 4);

(c) Cycling of tritium and other radionuclides of a global character in different types of ecosystems (Table J. 7, No. 7);

(d) Physical and biological effects on the environment of cooling systems and thermal discharges from nuclear power stations (Table J. 7, No. 5); and

(e) Studies on the source, distribution, deposition and fate of radium in inland waterways and aquifers (Table J. 7, No. 9). This is a new programme and will be expanded during the next few years.

Plans for 1979-82

J. 111. The work on ecological systems analysis has to be improved in the light of practical experience, the impact of added nuisances will have to be analysed cautiously in order to avoid undesirable situations resulting from rapid industrialization in developing countries. The use of sound models using computer systems will be developed in order to solve ecological problems.

J. 112. Emphasis will be placed on the impact of fast-breeder and high-temperature reactors on the environment, especially in considering the activation of trace elements in coolant systems.

J. 113. The work begun in co-operation with WHO and UNEP on registries of the radioactive releases, storage and disposal from the nuclear industry will continue.

J. 114. If necessary, attention will be focused on mining, milling and fuel fabrication in order to avoid uncontrolled releases, the impact of which could be stronger on the environment than that of the controlled releases from reactors and fuel reprocessing plants.

J. 115. The review of the Agency's recommendations made under the London Convention with regard to prevention of marine pollution will continue, with consultative meetings at least every two years.

Co-operation with other organizations

J. 116. Consultations on the work programme are held with FAO, OECD(NEA), UNESCO, WHO, WMO, ECE, UNEP and the Commission of the European Communities.

Decommissioning of nuclear facilities

Objective

J. 117. To collect and disseminate information on all aspects of decommissioning, to promote international co-operation in collating decommissioning experience, and to promote the development, with decommissioning in mind, of guides and recommendations pertinent to the design and the operational aspects of nuclear facilities.

Results to date

J. 118. This component was initiated in 1973 at a consultants' meeting, and a technical committee was convened in 1975 to co-ordinate activities and at this early stage to develop a body of information based on actual experience.

Plans for 1977-78

J.119. It is proposed to hold a further meeting on the decommissioning of nuclear facilities in 1977 (Technical Committee - Annex II (57)) and a major review of all aspects of decommissioning is planned for 1978 (Symposium - Annex III (12)) with special emphasis on criteria for decommissioning, design of the initial plant to ease decommissioning problems and on the economic, safety and regulatory aspects.

Plans for 1979-82

J.120. All information from Member States on experience gained and costs will be assembled and analysed with a view to the formulation by the Agency of internationally acceptable criteria.

Co-operation with other organizations

J.121. This component involves co-operation with OECD(NEA), ECE and UNEP.

Nuclear safety

OBJECTIVE

J.122. The objective is to provide Member States with advice and assistance for the safe siting, design, construction and operation of research reactors, nuclear power plants, and plants storing and processing nuclear materials, as well as with advice on licensing procedures and compliance controls. This objective will be pursued simultaneously through advisory missions, the progressive establishment of a coherent and comprehensive set of internationally acceptable safety codes and guides, the exchange of information and intensive training relating to specific nuclear safety and regulatory topics.

PLANS FOR 1977-82

J.123. Many of the countries now embarking on nuclear power programmes do not have the legislative and other regulatory provisions for laying down safety criteria and reviewing the safety of nuclear power projects, and they lack qualified manpower to carry out these functions. Experience has shown that the advice provided by the Agency on siting and safety reviews during the design, construction and operational stages of a project has been of great importance. It is therefore to be expected that the requests for advisory services and for safety assessments will lead to a considerable increase in the Agency's work.

J.124. At the same time the general increase in international orders for nuclear power plants will stress the problems inherent in the lack of internationally accepted safety codes and guides to ensure the safety and reliability of such plants with regard to their siting, design, construction and operation, including quality assurance. In particular it is important for the Agency to have a standard frame of reference for the safety assessments requested by Member States, as required under nuclear power project agreements.

J.125. The exchange of information through symposia and seminars will continue to be necessary in certain fields. Efforts will also be intensified to assist Member States embarking upon nuclear programmes to cope by themselves with reactor safety matters, in particular through proper, intensive training and guidance on regulatory programmes, operational safety and other selected safety topics.

STRUCTURE

J.126. This sub-programme consists of four components, which are described in the following paragraphs.

Nuclear safety

Summary by programme components

Table J. 6

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Advisory missions and safety evaluations of nuclear reactors including nuclear merchant ships	2.5	1.6	133 000	-	-	33 000	166 000
Standards for nuclear safety	4.8	3.8	334 600	264 000	-	36 600	635 200
Exchange of information and training	2.0	1.4	102 000	-	-	22 400	124 400
Nuclear reactor safety research and development	1.0	0.5	53 000	16 000	-	6 400	75 400
Linguistic, printing and publishing services	-	-	-	-	-	102 000	102 000
TOTAL	10.3	7.3	622 600	280 000	-	200 400	1 103 000

Advisory missions and safety evaluations of nuclear reactors including nuclear merchant ships

Objective

J. 127. The objective is to provide Member States with advice and assistance for the safe siting, design, construction and operation of nuclear reactors and of plants storing and processing nuclear materials, as well as advice on regulatory procedures and compliance controls, to make safety evaluations of nuclear merchant ships and harbour evaluation for the entry of such ships.

Results to date

J. 128. Safety assessments of research reactors have been made since 1960 and advice has been provided on the safety levels achieved at nuclear centres. Safety assessments of nuclear power plants have been made at either the pre-construction or construction phase. Since 1963 twelve countries have been assisted in the selection of sites for nuclear plants. Twenty-two Agency projects have been evaluated from the nuclear safety point of view before submission to the Board for approval in accordance with statutory requirements.

Plans for 1977-78

J. 129. It is expected that requests from Member States for the provision of advice to the authorities concerned with licensing nuclear power plants on the safety aspects of site selection, the safety assessment of the plants and the safety aspects of the technical specifications set forth in bids for the provision of nuclear power plants will continue to increase. The number of assessments required under nuclear power project agreements is also expected to increase. To meet these demands, the Agency will increase the number of its siting and safety missions and will make available its staff to advise regulatory bodies on the safety questions arising. The Agency will continue the provision of safety missions in connection with research reactors covered by projects agreements, on a periodic basis (every two-three years), and will offer to expand the scope of these advisory missions to include the safety aspects of nuclear facilities not subject to project agreements as well as nuclear facilities in selected groups of Member States on a regional basis.

Plans for 1979-82

J. 130. During 1979-82 it is expected that requests for advice will increase considerably at all stages of the licensing of nuclear plants from siting to operation. It will be necessary to make safety assessments of advanced types of nuclear power plants as well as gas-cooled, heavy-water or light-water reactors. The safety assessments required under project agreements will require more effort owing to the increasing number of projects concerning nuclear power plants. Nuclear safety inspections and advisory missions will continue to be sent to Member States party to project agreements with the Agency. The Agency's offer to expand the scope of safety missions to nuclear facilities not covered by project agreements will continue.

Standards for nuclear safety

Objective

J. 131. The objective is to develop an internationally agreed set of standards for nuclear power plants in the form of safety codes and guides which will be representative of the practices already in use in the Member States. These safety codes and guides will aim at ensuring the proper licensing and safe siting, design and operation, including quality assurance, of nuclear plants.

Plans for 1977-78

J. 132. The programme on nuclear safety standards (NUSS) for nuclear power plants initiated in late 1974 is now under way and it is planned to seek approval, at various stages, of draft safety codes and guides by Technical Review Committees (Annex II (60-75)) and the Senior Advisory Group (Annex II (76-80)) consisting of the representatives of advanced and developing countries. After comments from the Member States are received, the drafts will be amended, reconsidered by the Technical Review Committees and subsequently submitted to the Board of Governors for approval.

J. 133. Codes of practice on governmental organization, siting, design, operation and quality assurance will be submitted to the Board for approval. During this same period eight safety guides on governmental organization topics, ten guides on siting topics, six guides on design topics, five guides on operational topics and nine guides on quality assurance topics will also be completed. Further safety guides will be in preparation. The necessary steps will have been taken to start to extend the standards programme to cover the development of codes and guides applicable to facilities of the nuclear fuel cycle.

Plans for 1979-82

J. 134. An average of ten safety guides will be prepared for publication by the Agency every year for the period 1977-82. Work will continue on the codes and guides for fuel cycle facilities. The initial documents which will have been issued may need revision or supplementing in the light of further experience in the operation of the present generation of power plants.

J. 135. Work will continue as appropriate in the light of achievements in 1977-78 and it will be necessary to start developing safety standards covering new types of nuclear power plants, including floating nuclear power plants and plants such as high-temperature gas-cooled reactors, fast-breeder reactors and others. Such plants are not covered by the Agency's safety programme at present because of the lack of sufficient experience in their construction and operation. By 1980 more information will be available on those plants and national standards will be issued. For this reason two or three safety codes of practice and approximately 15 to 20 safety guides will be prepared and published during the period 1979-1982.

J. 136. Definite plans will have been made regarding the development of safety standards applicable to all phases of the nuclear fuel cycle.

Exchange of information and training

Objective

J. 137. The objective is to provide for various forms of training and the transfer of information with a view to increasing the knowledge and understanding of the various approaches and practices followed in regard to nuclear safety.

Results to date

J. 138. A symposium on siting of nuclear power plants was held in 1974 in co-sponsorship with OECD(NEA). Emphasis has been given to participation of the nuclear safety staff in the training aspects of nuclear safety. Staff members acted as technical advisers to the study tour on development of nuclear power in Bulgaria, Czechoslovakia, the German Democratic Republic and the Soviet Union. Lectures on regulatory activities including site and safety evaluation of nuclear power plants were given at the Agency course on nuclear power project management held at Karlsruhe and the seminar in Kingston, Jamaica. Members of the staff also organized and acted as technical advisers for the regulatory training course conducted in the United States of America and the Technical Committee on the structure and review of safety reports in Bangkok, Thailand.

Plans for 1977-78

J. 139. Subject to the availability of funds, regional training courses will be held on regulatory requirements in connection with nuclear plant safety, including topics such as organization and manpower requirements for regulatory review, siting, safety analysis reports, and inspection procedures. The manpower to be trained will mainly consist of engineers and staff involved in the regulation and operation of nuclear plants. A symposium on the problems associated with the export of nuclear power reactors will be held in 1978 in conjunction with the Division of Nuclear Power and Reactors (Symposium - Annex III (13)).

Plans for 1979-82

J. 140. The exchange of technical information through panels and seminars will continue to be necessary in specific safety and regulatory areas. One or two meetings will be held each year on different subjects such as siting, safety analysis, engineered safety features, and reference safety analysis reports. Symposia may be held on the safety aspects of the more advanced concepts and designs such as off-shore siting, fast reactors, and gas-cooled reactors.

Nuclear reactor safety research and development

Objective

J. 141. The objective is to keep abreast of the progress in nuclear safety research and development in connection with new and future types of reactors and to provide for the exchange of information on the results of this research and development.

Results to date

J. 142. Liaison has been maintained with OECD(NEA) through the Committee on Reactor Engineering Technology and more recently with the Committee for the Safety of Nuclear Installations on topics of mutual interest in the field of nuclear safety.

Plans for 1977-78

J. 143. Two advisory groups, one on thermal reactor safety research and development and the other on fast reactor safety research and development will be convened. These groups will be composed of experts who are working in national programmes of reactor safety research, and will deal with topics of current interest (e. g. blowdown and emergency

core cooling, power transients, core disassembly accidents and fuel coolant interactions) (Advisory Groups - Annex II (58 and 59)). The Agency's participation and co-operation in international safety research programmes will continue.

Plans for 1979-82

J. 144. Additional symposia or seminars will be held to help disseminate the results of reactor safety research and development work to developing countries. As additional safety research facilities become operational and as results of on-going national programmes emerge, topics for the yearly meetings of the thermal reactor and fast reactor safety research technical committees will be selected. Such topics might include core meltdown and after-heat removal, safety of automatic control systems, development of risk analysis techniques, etc. The Agency's participation in international safety research programmes will continue.

Co-ordinated research programmes

Table J. 7

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. Environmental monitoring for radiological protection in Asia and the Far East	8	1	1972	1977
2. Environmental monitoring for radioactive contaminants in the vicinity of nuclear installations in Latin America	This programme has been approved but no contract has yet been awarded			
3. Radiological and environmental protection studies in the Danube river catchment area	This programme has been approved but no contract has yet been awarded			
4. Study of integrated radioactive waste management systems and their impact on the environment	3	-	1972	1977
5. Physical and biological effects on the environment of cooling systems and thermal discharges from nuclear power stations	1	17	1973	1978
6. Dispersion of radionuclides from the storage of radioactive wastes under various conditions in the terrestrial environment	3	-	1972	1977
7. Cycling of tritium and other radionuclides of a global character in different types of ecosystems	5	6	1972	1977
8. Marine radioactivity studies	5	7	1967	1976
9. Studies on the source, distribution, deposition and fate of radium in inland waterways and aquifers	2	2	1975	1979

K. INTERNATIONAL LABORATORY OF MARINE RADIOACTIVITY

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table K. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	316 566	379 000	66 000	20 000	86 000	465 000	494 000
Consultants	-	4 500	500	-	500	5 000	6 000
Sub-total	316 566	383 500	66 500	20 000	86 500	470 000	500 000
Common staff costs	94 525	110 500	23 000	6 000	29 000	139 500	149 300
Travel	6 405	5 000	500	1 500	2 000	7 000	8 000
Representation and hospitality	-	1 000	200	300	500	1 500	1 700
Scientific supplies and equipment	64 489	49 000	5 000	11 000	16 000	65 000	80 000
Common services, supplies and equipment	135 010	24 000	4 500	4 500	9 000	33 000	36 000
Transfer of costs:							
Linguistic services	-	1 000	-	-	-	1 000	2 000
Printing and publishing services	1 830	3 000	-	-	-	3 000	4 000
TOTAL	618 825	577 000	99 700 17.3%	43 300 7.5%	143 000 24.8%	720 000	781 000
Source of funds							
Regular Budget	521 245	498 000	73 700 14.8 %	38 300 7.7 %	112 000 22.5 %	610 000	678 000
Operating Fund I	97 580	79 000	26 000	5 000	31 000	110 000	103 000
TOTAL	618 825	577 000	99 700 17.3%	43 300 7.5%	143 000 24.8%	720 000	781 000

SUMMARY OF MANPOWER

Table K. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
P-5	2	2	2	-	2	2
P-4	2	3	3	-	3	3
P-3	1	1	1	-	1	1
P-1	3	3	3	(1)	2	2
Sub-total	8	9	9	(1)	8	8
GS	13	13	13	2	15	15
TOTAL	21	22	22	1	23	23

CHANGES IN COSTS AND MANPOWER

Costs

K. 1. As will be seen from Table K. 1 above, it is expected that the cost of this programme will increase by $143 000 in 1977, of which $99 700 will be required to cover salary and other price increases and $43 300 will be a programme increase.

K. 2. A programme increase of $26 000 in respect of salaries for established posts and common staff costs is foreseen as the result of the addition of one GS post, the downgrading of a P-1 post to the GS level and a reduction in the savings achieved through delays in recruitment.

K. 3. Programme increases are foreseen in respect of travel ($1500) and hospitality ($300). In respect of scientific supplies and equipment, the acquisition of a liquid scintillation counter and a thermoluminescence dosimetry system including an irradiation source will be required, which results in a programme increase of $11 000 compared with the requirements budgeted for 1976. The programme increase of $4500 in respect of common services, supplies and equipment is due to an expansion in the activities of the laboratory.

K. 4. Of the total increase of $143 000, an amount of $112 000 will be provided from the Regular Budget and $31 000 from the Operational Budget. In addition to the contribution from the Monegasque Government, $2000 will be contributed by UNESCO under a contractual arrangement and the balance will be covered by miscellaneous income.

Manpower

K. 5. As will be seen from Table K. 2 above, one additional GS post will be required for an electro-mechanic. The replacement of one P-1 post by a GS post is foreseen in the "Environmental studies" sub-programme. No further change in the manning table is foreseen for 1978.

THE PROGRAMME

OBJECTIVE

K. 6. The objective is to promote the intercomparability of radioactivity measurements made in national laboratories and institutes for marine radioactivity studies, to develop reference analytical methods and techniques for investigating the behaviour of radioactivity in the oceans and to obtain the scientific information needed to assess the impact of waste disposal and nuclear power generation on the environment.

STRUCTURE

K. 7. This programme consists of three sub-programmes, which are dealt with separately below.

Summary of manpower and costs by sub-programmes

Table K. 3

Sub-programme	1977 Estimate					1978 Preliminary estimate				
	Man-years		Costs			Man-years		Costs		
	P	GS	Staff	Other	Total	P	GS	Staff	Other	Total
Biology	3.0	5.0	214 500	34 500	249 000	3.0	5.0	227 000	42 000	269 000
Chemistry	2.5	5.0	195 000	41 000	236 000	2.5	5.0	208 300	47 700	256 000
Environmental studies	2.5	5.0	200 000	35 000	235 000	2.5	5.0	214 000	42 000	256 000
TOTAL	8.0	15.0	609 500	110 500	720 000	8.0	15.0	649 300	131 700	781 000

SUB-PROGRAMMES

Biology

OBJECTIVE

K. 8. The objective is to develop and evaluate methods for assessing the importance of biological processes in the transport of radionuclides and trace metals in the ocean and to investigate the biological effects of non-radioactive constituents of reactor cooling waters on aquatic biota by studying the biological transport of selected heavy metals, activation products and alpha-emitting radionuclides and the synergistic sublethal effects of metals, biocides and chlorinated hydrocarbons on selected marine organisms.

RESULTS TO DATE

K. 9. Mathematical models for assessing the role played by zooplankton in transporting radionuclides and trace metals from the ocean surface layers to depth have been developed. For certain elements (for example, transuranic elements), biological pathways have been shown to be particularly important.

PLANS FOR 1977-78

K. 10. Studies of zooplankton metabolic activity as it relates to the vertical transport of pollutants will continue, special attention being paid to transuranic radionuclides.

RELATED ACTIVITIES

K. 11. With UNEP support, the models developed for the prediction of radionuclide transport will be applied to chlorinated hydrocarbons and other pollutants.

PLANS FOR 1979-82

K. 12. Studies of the effects of metals, biocides and chlorinated hydrocarbons on various marine species will be initiated.

CO-OPERATION WITH OTHER ORGANIZATIONS

K. 13. Continued co-operation with UNEP is envisaged.

Chemistry

OBJECTIVE

K.14. The objective is to develop reference analytical methods for the determination of radionuclides and heavy metals in marine samples - through: the intercalibration programme for radioactivity measurements (1971-77); the UNEP-supported intercalibration programme for heavy metal measurements (1973-78); and studies of the biogeochemical behaviour of transuranic elements in the marine environment - with a view to gaining the necessary scientific knowledge relating to the possibility and practicality of the disposal of medium- and high-level wastes in the deep sea.

RESULTS TO DATE

K.15. The results obtained with marine samples containing different levels of radioactivity are difficult to compare, regardless of sample type. While some improvement has been noted with repetitive analyses, the problems of standardization and data analysis continue to pose serious doubts about the budgeting of radioactivity in the world oceans.

PLANS FOR 1977-78

K.16. The intercalibration programme for radioactivity measurements will be concluded in 1977. Work will continue on the development of reference methods of analysis, as will fundamental work relating to biogeochemical studies of transuranic elements. A related programme for the intercalibration of measurements of trace metals in marine samples will be conducted under UNEP sponsorship.

RELATED ACTIVITIES

K.17. New techniques for the direct measurement of heavy metals in sea water by anodic stripping voltametry will be explored.

PLANS FOR 1979-82

K.18. Work will continue on transuranic biogeochemistry and trace metal measurement techniques. Fundamental studies of radionuclide and trace metal behaviour in deep ocean waters as it relates to the disposal of radioactive wastes at sea will be initiated.

CO-OPERATION WITH OTHER ORGANIZATIONS

K.19. Continued co-operation with UNESCO and UNEP in 1977 is envisaged.

Environmental studies

OBJECTIVE

K.20. The objective is to determine the influence of interactions involving sediments in sea water on the distribution of radionuclides in the marine environment and to investigate the formation and persistence of organochlorine compounds resulting from the chlorine treatment of reactor cooling waters by studying the formation of biocidal organochlorine compounds of low molecular weight which could result from the chlorination of sea water used in reactor cooling systems (1977-78) and by studying the effects of biocides on selected marine organisms (1977-82).

RESULTS TO DATE

K.21. The study of radioisotope-sediment interactions, initiated in 1970, was completed in 1974. Emphasis was placed on the study of chlorine interactions with organic matter in sea water to assess the effect of the use of chlorine as a condenser cleaning agent. Techniques were developed for the measurement of mono- and dichloramines (bromamines) and of chlorinated hydrocarbons of low molecular weight.

PLANS FOR 1977-78

K.22. Studies will continue on the formation of low-molecular chlorinated hydrocarbons which result from interactions of chlorine with organic matter in sea water. These studies will include the development of the analytical techniques necessary for the identification and quantification of the products which result from such interactions. Upon identification of these products, their effects on marine organisms will be studied.

RELATED ACTIVITIES

K.23. An intercalibration programme for the measurement of chlorinated hydrocarbons will be conducted under UNEP sponsorship. In addition, measurements of chlorinated hydrocarbons in the Mediterranean Sea will be performed with a view to studying their transport and fate in marine systems.

PLANS FOR 1979-82

K.24. Studies of the effects of chlorinated hydrocarbons on marine organisms will continue.

CO-OPERATION WITH OTHER ORGANIZATIONS

K.25. Continued co-operation with UNEP is envisaged.

L. INFORMATION AND TECHNICAL SERVICES

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table L. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	1 239 847	1 462 000	145 000	(17 000)	128 000	1 590 000	1 751 000
Consultants	-	10 500	1 700	(1 200)	500	11 000	9 000
Overtime	8 225	13 300	900	(200)	700	14 000	15 000
Temporary assistance	21 670	21 700	1 300	(500)	800	22 500	27 000
Sub-total	1 269 742	1 507 500	148 900	(18 900)	130 000	1 637 500	1 802 000
Common staff costs	370 386	426 500	56 100	(5 000)	51 100	477 600	526 000
Travel	21 770	24 500	1 100	1 400	2 500	27 000	34 000
Meetings							
Conferences, symposia, seminars	6 958	8 000	400	3 600	4 000	12 000	13 000
Technical committees, advisory groups	17 681	29 000	1 300	(300)	1 000	30 000	41 000
Representation and hospitality	2 120	2 000	400	-	400	2 400	2 700
Scientific and technical contracts	18 583	36 000	500	(10 000)	(9 500)	26 500	27 300
Common services, supplies and equipment	1 440 011	1 153 500	90 500	14 000	104 500	1 258 000	1 443 000
Other items of expenditure	40	-	-	-	-	-	-
Transfer of costs:							
Linguistic services	55 173	109 000	11 000	(22 000)	(11 000)	98 000	125 000
Printing and publishing services	384 728	436 000	30 000	(24 000)	6 000	442 000	488 000
Data processing services	(799 669)	(841 000)	(73 000)	(192 000)	(265 000)	(1 106 000)	(1 263 000)
TOTAL	2 787 523	2 891 000	267 200 9,2 %	(253 200) (8,7%)	14 000 0,5%	2 905 000	3 239 000

SUMMARY OF MANPOWER

Table L. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	3	3	3	-	3	4
P-4	9	10	10	1	11	11
P-3	7	8	8	-	8	10
P-2	7	6	6	(1)	5	6
P-1	6	5	5	-	5	2
Sub-total	33	33	33	-	33	34
GS	66	72	72	3	75	77
M&O	1	-	-	-	-	-
TOTAL	100	105	105	3	108	111

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 $14 000 as a net result of price increases of $267 200 partly offset by a programme decrease of $253 200.

L.2. In spite of the addition of three GS posts and the replacement of a P-2 post by a P-4 post as shown in Table L.2 above, a programme reduction of $22 000 is foreseen in respect of salaries for established posts and common staff costs, due to the lapsing of existing posts. A programme reduction of $47 300 will be achieved by keeping the post of the Chief Librarian vacant in 1977, and by replacing a high-graded GS staff member in the Library who used to provide reimbursable library services to UNIDO by a low-graded GS staff member in the Journals section. Since the cataloguing service will be discontinued, no income from UNIDO is foreseen in respect of this activity from 1977 onward.

L.3. In the INIS sub-programme there will be a programme decrease of $2600 in respect of salaries and common staff costs in spite of the addition of one GS post and the up-grading of a Professional post by delaying recruitment for vacant posts. In the "Computer services" sub-programme an increase of $27 900 is due to the addition of two GS posts and a reduction in delays in recruitment.

L.4. Small decreases are foreseen in respect of consultants and temporary assistance. The programme increase of $1400 in respect of travel will be required in the computer sub-programme. The programme increase of $3600 in respect of symposia and seminars is related to the INIS training seminar. In respect of technical committees and advisory groups there is a programme decrease of only $300 although the number of meetings will be one less than planned for 1976. A reduction of $10 000 is foreseen in respect of scientific and technical contracts for the INIS sub-programme.

L.5. The programme increase of $14 000 in respect of common services, supplies and equipment is the net result of an increase of $17 000 in the requirements of the Library, a reduction of $29 000 in the INIS sub-programme due to a switch of the mailing costs from common services to printing and publishing services and an increase of $26 000 for the computer services.

L.6. It is expected that a programme reduction of $22 000 will be possible in respect of linguistic services, and a decrease of $24 000 in respect of printing and publishing services.

L.7. The decrease of $192 000 in respect of data processing services represents a programme increase in the charges transferred to other programmes.

L.8. It is expected that the income from INIS publications will be $225 000 in 1977. Reimbursable services will be provided by the computer section in an amount of $365 000, $325 000 to UNIDO and $40 000 to AGRIS. Of the total costs of data processing services which are expected to be $1 905 000 in 1977, $1 540 000 are apportioned to the programmes using these services and only the reimbursable services rendered to UNIDO and AGRIS remain a charge against the computer sub-programme (see Tables L.5 and L.6).

Manpower

L.9. As will be seen from Table L.2 above, three additional GS posts and the replacement of a P-2 post by a P-4 post will be required. The latter is the result of up-grading one P-3 post in the INIS sub-programme to the P-4 level for the recruitment of a qualified person to deal with abstract development and automatic indexing techniques, and up-grading one P-2 post in the Library to the P-3 level for the officer in charge of the Library.

L.10. One additional GS post will be required in the INIS sub-programme for the bibliographic control unit, and two GS posts will be needed in the computer sub-programme, one for a data preparation clerk, and one for a computer operator.

L.11. For 1978 one additional P-5 post will be required for INIS; for the computer services two additional GS posts will be needed, and it is planned to replace the three existing P-1 posts by one P-2 post and two P-3 posts.

Cost of the Office of the Director, the scientific journals and the Library

Table L. 3

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	249 972	280 000	33 000	(36 000)	(3 000)	277 000	301 000
Consultants	-	-	-	3 000	3 000	3 000	-
Overtime	-	600	100	300	400	1 000	1 000
Temporary assistance	6 177	2 400	100	1 000	1 100	3 500	4 000
Sub-total	256 149	283 000	33 200	(31 700)	1 500	284 500	306 000
Common staff costs	74 850	81 400	13 300	(11 300)	2 000	83 400	91 000
Travel	4 412	6 500	100	400	500	7 000	8 000
Meetings							
Technical committees, advisory groups	-	4 000	-	(4 000)	(4 000)	-	-
Representation and hospitality	537	600	-	-	-	600	700
Scientific and technical contracts	15 790	18 000	500	-	500	18 500	19 300
Common services, supplies and equipment	243 716	128 500	19 500	17 000	36 500	165 000	185 000
Transfer of costs:							
Linguistic services	40 409	101 000	10 000	(30 000)	(20 000)	81 000	106 000
Printing and publishing services	191 523	197 000	14 000	(30 000)	(16 000)	181 000	208 000
Data processing services	31 066	37 000	4 000	(6 000)	(2 000)	35 000	55 000
TOTAL	858 452	857 000	94 600	(95 600)	(1 000)	856 000	979 000

Cost of INIS activities

Table L. 4

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	457 964	540 000	40 000	(2 000)	38 000	578 000	636 000
Consultants	-	7 000	1 500	(4 500)	(3 000)	4 000	5 000
Overtime	1 175	700	100	200	300	1 000	2 000
Temporary assistance	12 764	11 800	700	(1 500)	(800)	11 000	15 000
Sub-total	471 903	559 500	42 300	(7 800)	34 500	594 000	658 000
Common staff costs	136 747	158 100	15 700	(600)	15 100	173 200	191 000
Travel	9 296	11 000	500	(500)	-	11 000	16 000
Meetings							
Conferences, symposia seminars	6 958	8 000	400	3 600	4 000	12 000	13 000
Technical committees, advisory groups	17 681	25 000	1 300	3 700	5 000	30 000	41 000
Representation and hospitality	1 583	1 400	400	-	400	1 800	2 000
Scientific and technical contracts	1 293	18 000	-	(10 000)	(10 000)	8 000	8 000
Common services, supplies and equipment	385 997	204 000	20 000	(29 000)	(9 000)	195 000	210 000
Transfer of costs:							
Linguistic services	14 595	8 000	1 000	8 000	9 000	17 000	19 000
Printing and publishing services	188 161	206 000	15 000	31 000	46 000	252 000	270 000
Data processing services	403 870	435 000	41 000	(86 000)	(45 000)	390 000	437 000
TOTAL	1 638 084	1 634 000	137 600	(87 600)	50 000	1 684 000	1 865 000

Cost of computer services

Table L. 5

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	531 911	642 000	72 000	21 000	93 000	735 000	814 000
Consultants	-	3 500	200	300	500	4 000	4 000
Overtime	7 050	12 000	700	(700)	-	12 000	12 000
Temporary assistance	2 729	7 500	500	-	500	8 000	8 000
Sub-total	541 690	665 000	73 400	20 600	94 000	759 000	838 000
Common staff costs	158 789	187 000	27 100	6 900	34 000	221 000	244 000
Travel	8 062	7 000	500	1 500	2 000	9 000	10 000
Scientific and technical contracts	1 500	-	-	-	-	-	-
Common services, supplies and equipment	810 298	821 000	51 000	26 000	77 000	898 000	1 048 000
Other items of expenditure	40	-	-	-	-	-	-
Transfer of costs:							
Linguistic services	169	-	-	-	-	-	-
Printing and publishing services	5 044	33 000	1 000	(25 000)	(24 000)	9 000	10 000
Data processing services	(1 234 605)	(1 313 000)	(118 000)	(100 000)	(218 000)	(1 531 000)	(1 755 000)
TOTAL	290 987	400 000	35 000	(70 000)	(35 000)	365 000	395 000

Computer services: Breakdown of costs by programme

Table L. 6

Programme	1975 Actual obligations	1976 Adjusted budget	1977 Estimate	1978 Preliminary estimate
Technical assistance	14 019	2 000	6 000	8 000
Food and agriculture	6 197	19 000	15 000	30 000
Life sciences	14 878	30 000	15 000	20 000
Physical sciences	53 375	100 000	73 000	77 000
Laboratory	28 685	5 000	28 000	30 000
Nuclear power and reactors	148 012	100 000	234 000	250 000
Information and technical services				
INIS	403 870	435 000	390 000	437 000
Library	31 066	37 000	35 000	55 000
Safeguards	151 175	125 000	400 000	500 000
Administration	334 865	414 000	292 000	298 000
General services	48 463	22 000	-	-
Service activities				
Printing and publishing services	-	24 000	43 000	50 000
Transfer of costs to other programmes	1 234 605	1 313 000	1 531 000	1 755 000
Reimbursable services	290 987	400 000	365 000	395 000
TOTAL	1 525 592	1 713 000	1 896 000	2 150 000

Summary of manpower by organization unit and category

Table L. 7

Organization unit	1975 Adjusted budget				1976 Adjusted budget				1977 Estimate				1978 Preliminary estimate			
	P	GS	M&O	Total	P	GS	M&O	Total	P	GS	M&O	Total	P	GS	M&O	Total
Office of the Director	2	3	-	5	2	4	-	6	2	4	-	6	2	4	-	6
INIS Section	14	21	-	35	14	23	-	37	14	24	-	38	15	24	-	39
Library	5	10	1	16	4	10	-	14	4	10	-	14	4	10	-	14
Computer Section	12	32	-	44	13	35	-	48	13	37	-	50	13	39	-	52
TOTAL	33	66	1	100	33	72	-	105	33	75	-	108	34	77	-	111

THE PROGRAMME

OBJECTIVE

L. 12. 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.

STRUCTURE

L. 13. This programme consists of four sub-programmes, which are described in the following paragraphs.

SUB - PROGRAMMES

INIS

OBJECTIVE

L. 14. The objective is to plan and operate, in collaboration with Member States, a comprehensive nuclear information and abstracting service, using modern computer and reprographic techniques; this involves processing input received from Member States, providing Member States with output in a variety of forms for dissemination on a national basis and assisting Member States in improving their methods of information handling.

RESULTS TO DATE

L. 15. The system commenced operation in 1970 and developed quickly during the following years. The number of items processed annually increased from 4000 in the first year of operation to 65 000 in 1974. The number of items processed did not change significantly in 1975, an indication that steady-state operation is being approached. Thirteen international organizations and 46 Member States are now participating in INIS.

L. 16. The First Advisory Committee for INIS met in 1971 and the Second Advisory Committee in 1974. On each occasion progress was reviewed and recommendations made on ways of further improving the system. Major developments that have taken place as a result of those recommendations include conversion to full-scope operation and the adoption of a new thesaurus in 1972, the introduction of a subject index to INIS ATOMINDEX in 1973 and the gradual inclusion of machine-readable abstracts during 1975. Commencing this year, INIS ATOMINDEX is being published as an international nuclear science abstracting journal.

L. 17. On 1 July 1976 INIS ATOMINDEX will become the world's only international abstracting service in the nuclear field, the United States having officially announced its intention of discontinuing Nuclear Science Abstracts (NSA) with effect from that date. During its 30-year life, NSA achieved a very high standard, and every effort will be made to make INIS ATOMINDEX a worthy successor.

L. 18. Close liaison has been maintained with national INIS centres. Consultative meetings of INIS Liaison Officers have been held each year since 1972. Annual seminars have been directed both towards the preparation of input and towards the utilization of output products, with growing emphasis on the latter.

PLANS FOR 1977-78

L. 19. It is expected that the number of items processed each month by INIS will remain within the range 5000-6000. No major changes in subject coverage are anticipated.

L. 20. Efforts will be concentrated on maintaining the quality of INIS ATOMINDEX and the magnetic tape service and on assisting Member States to utilize them in the most effective way. To this end the existing training programmes will be improved, advantage being taken of up-to-date teaching methods, and their scope expanded; consultants will be engaged to assist the Agency in this.

L. 21. INIS will continue to give Member States technical advice on the establishment, operation and management of modern information systems and to assist INIS centres in developing the software necessary for exploiting fully the INIS magnetic tapes.

L. 22. In recognition of the need to improve access to copies of the literature abstracted by INIS, the Agency will promote and co-ordinate the development of a document delivery system based on the co-operation of the INIS Liaison Officers, who have undertaken to make available copies of documents published within their centres and through whom requests for publications will be channelled. The system will be supported by the resources of the Agency's Library and the INIS Clearinghouse.

L. 23. There will be more extensive use within the Agency's Headquarters of interactive computer methods for the retrieval of information from the cumulative INIS data base and for the processing and editing of input data. At the same time, teleprocessing trials will be initiated in collaboration with selected Member States, the aim being to explore the possibility of performing INIS input and retrieval operations over long distances by means of remote terminals.

L. 24. It is expected that FAO will continue to seek the Agency's assistance in the processing of information for AGRIS.

L. 25. It is planned to hold two further INIS seminars, probably in conjunction with FAO, one in 1977 (Seminar - Annex I (25)) and one in 1978; consultative meetings of INIS Liaison Officers will be held in both years (Technical Committee - Annex II (81)). In line with the established practice of reviewing periodically, with the help of experts from Member States, the basic working tools of INIS, technical committees will be convened to discuss improvements in and alterations to the INIS Thesaurus and the INIS subject scope (Technical Committee - Annex II (82)). A technical committee meeting to study problems of automatic indexing is also planned for 1978.

RELATED ACTIVITIES

L. 26. These include the provision of advisory services and the formulation of internationally acceptable standards for information processing.

PLANS FOR 1979-82

L. 27. If the anticipated growth in the amount of information published takes place, the demand for sophisticated systems for information processing, storage and retrieval will increase. Developments in the information handling field will continue to be followed and those methods will be incorporated into INIS which can best contribute to its lasting effectiveness. In particular, advances in automatic indexing, in teleprocessing and in conversational computing promise to have a profound impact on INIS methodology. Liaison with and the training of personnel participating in the system at the national level will continue to receive high priority, to ensure that INIS remains responsive to the information needs of Member States. A meeting of the Advisory Committee for INIS will be held in 1979.

CO-OPERATION WITH OTHER ORGANIZATIONS

L. 28. This sub-programme involves co-operation with UNESCO, FAO, EURATOM, ISO and the INIS centres of Member States and of other international organizations.

Library services

OBJECTIVE

L. 29. The objective is to provide the Secretariat and Member States with comprehensive library-based information and document services by acquiring and maintaining a first-class collection of current literature, organized on modern lines, and by stimulating, developing and co-ordinating the growth of an international co-operative network of nuclear libraries.

RESULTS TO DATE

L. 30. Emphasis to date has been mainly on improving the efficiency with which acquisition, cataloguing and classification are performed. A computer-produced book catalogue has been completed; it provides a record of the Library's monograph holdings acquired since 1968.

L. 31. Some personnel reorganization has taken place with the aim of improving the efficiency of the Library's operations and the quality of its services. Reclassification and recataloguing of the reference collection have been completed and records of the holdings have been incorporated into the computer-readable data base.

PLANS FOR 1977-78

L. 32. With many of the Library's technical activities automated, the main emphasis will be on improving the reference and information services provided by the Library to the Secretariat and to Member States. In particular, close co-operation will be established, through the INIS Liaison Officers, with nuclear libraries in Member States; the aim is to support the activities which are being initiated within the "INIS" sub-programme and which are intended to assist scientists throughout the world in obtaining nuclear literature and other reference materials more quickly.

L. 33. A training programme for librarians from Member States will also be developed; it will provide short courses aimed at teaching librarians with generalized backgrounds how to acquire, organize and use sources of nuclear information.

L. 34. The computerization of data on serials accessions, started this year, will be completed.

PLANS FOR 1979-82

L. 35. The move to the Donaupark will give the Library further opportunities to improve the reference and information services which it provides for the Secretariat; for example, a number of service points will be established to ensure convenient access to the Library's resources. Special efforts will be made to make the Library's collections more responsive to the needs of the Secretariat and Member States. Rapid methods for the supply of photocopies will become available. Steps will be taken to strengthen further the co-operation between nuclear libraries in Member States and increase its effectiveness; these will include the production of union catalogues, the publication of a directory describing the collections and services offered by participating libraries and the fostering of inter-library loan and exchange agreements.

CO-OPERATION WITH OTHER ORGANIZATIONS

L. 36. There will be close co-operation with UNESCO, the International Federation of Library Associations and the International Federation for Documentation in the planning of training programmes for librarians.

Computer services

OBJECTIVE

L. 37. The objective is to provide electronic data processing services in support of technical information, management and various other activities of the Agency and UNIDO.

RESULTS TO DATE

L. 38. The present computer, an IBM 370/145, was installed in July 1972, replacing the smaller IBM 360/30. The availability of the IBM 370/145 has made it possible to do work and plan projects which would not have been feasible otherwise. For example, it has become possible to develop further the processing of information for administrative purposes and of technical information and to include the processing of safeguards information and scientific/engineering modelling.

PLANS FOR 1977-78

L. 39. The Computer Section will continue to provide computer services for the Agency and UNIDO. Teleprocessing systems which will give users on-line, real-time, interactive data processing possibilities are planned. An expanded core memory of 1024K bytes and additional peripheral storage will provide a better response to the computational and on-line storage needs of users such as the Department of Safeguards and Inspection and INIS. It is expected that the Computer Section will continue to work three shifts per day, there being also provision for Saturday and Sunday work when required. Current trends suggest that by 1978 the present central processing unit (CPU) will be unable to cope with the work load even with Saturday and Sunday operation, and that a major up-grading of the CPU will therefore be needed.

L. 40. There will be greater contact with computer centres in developing countries.

PLANS FOR 1979-82

L. 41. It is expected that the computer work load will continue to grow, especially in the areas of safeguards information processing and on-line, real-time data inquiry and up-dating for teleprocessing activities. A major up-grading of the CPU in 1978 would provide the computational capability which will be required by 1979. However, further peripheral storage and on-line terminal equipment will be added to meet user requirements.

CO-OPERATION WITH OTHER ORGANIZATIONS

L. 42. The possibilities of co-operation with other United Nations organizations are being explored.

Scientific journals

OBJECTIVE

L. 43. The objective is to disseminate information on current research in controlled thermonuclear fusion and plasma physics through Nuclear Fusion and information on current developments in the peaceful application of atomic energy through Atomic Energy Review.

RESULTS TO DATE

L. 44. Publication of Nuclear Fusion commenced in 1960. Initially, it appeared quarterly, but in 1971 it became a bi-monthly journal. The number of printed pages increased from 680 in 1971 to 1210 in 1975 and Nuclear Fusion is now the major international journal on controlled thermonuclear fusion and plasma physics.

L. 45. Atomic Energy Review, publication of which commenced in 1963, is an authoritative review journal covering all aspects of the peaceful uses of atomic energy.

L. 46. Special issues of and supplements to both journals are published occasionally. For example, six volumes in the series entitled "Thermodynamic Properties of Nuclear Elements and their Compounds" (covering plutonium, niobium, tantalum, beryllium, thorium and zirconium) have been published as special issues of Atomic Energy Review; two editions of a triennial "World Survey of Major Facilities in Controlled Fusion Research" were published as supplements to Nuclear Fusion in 1970 and 1973 and a third is being published this year; supplements to Nuclear Fusion containing English translations of papers presented in Russian at the Agency's International Conferences on Plasma Physics and Controlled Nuclear Fusion Research were published in 1969, 1972 and 1975.

PLANS FOR 1977-78

L. 47. Because of the increase in the number of manuscripts being submitted for publication, it has been decided to make Nuclear Fusion a monthly journal, starting in 1978. The number of copies of Nuclear Fusion distributed free of charge will be reduced as one of the measures for making the journal more self-supporting financially. The proceedings of the Agency's International Conferences on Plasma Physics and Controlled Nuclear Fusion Research will be published every second year as further supplements to Nuclear Fusion.

L. 48. Atomic Energy Review will be critically appraised in the light of current needs of Member States for a general review journal in the nuclear science field. It is planned to complete the series entitled "Thermodynamic Properties of Nuclear Elements and their Compounds" by the end of 1978, with volumes on molybdenum, hafnium and titanium.

PLANS FOR 1979-82

L. 49. Nuclear Fusion will continue to be published monthly with supplements concerning the proceedings of the Agency's International Conferences on Plasma Physics and Controlled Nuclear Fusion Research appearing every second year and the "World Survey of Major Facilities in Controlled Fusion Research" appearing every third year. Depending on the results of the appraisal of Atomic Energy Review, consideration will be given to altering its publication frequency. It is planned to issue detailed subject and author indexes to all volumes of both journals published so far.

CO-OPERATION WITH OTHER ORGANIZATIONS

L. 50. Since Nuclear Fusion and Atomic Energy Review function through a system of independent referees, there is constant communication with scientific organizations and with individual scientists, some of whom are members of the Boards of Editors of the two journals. There is close co-operation with the International Fusion Research Council in the publication of Nuclear Fusion.

M. NUCLEAR EXPLOSIONS FOR PEACEFUL PURPOSES

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table M. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	35 597	37 000	8 000	22 000	30 000	67 000	78 000
Consultants	225	15 000	500	1 500	2 000	17 000	17 500
Overtime	58	-	-	300	300	300	400
Temporary assistance	404	-	-	800	800	800	800
Sub-total	36 284	52 000	8 500	24 600	33 100	85 100	96 700
Common staff costs	10 151	11 100	2 000	7 000	9 000	20 100	24 000
Travel	-	2 000	100	3 600	3 700	5 700	5 000
Meetings							
Technical committees, advisory groups	15 589	35 000	1 500	(10 500)	(9 000)	26 000	66 000
Representation and hospitality	436	900	200	-	200	1 100	1 200
Common services, supplies and equipment	1 181	-	-	1 000	1 000	1 000	1 100
Transfer of costs:							
Linguistic services	22 693	28 000	3 000	4 000	7 000	35 000	36 000
Printing and publishing services	14 688	25 000	2 000	1 000	3 000	28 000	20 000
From other programmes	-	54 000	4 000	-	4 000	58 000	62 000
TOTAL	101 022	208 000	21 300 10,2%	30 700 14,8%	52 000 25,0%	260 000	312 000

SUMMARY OF MANPOWER

Table M. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
P-5	-	1	1	-	1	1
P-4	1	-	-	1	1	1
Sub-total	1	1	1	1	2	2
GS	-	1	1	-	1	1
TOTAL	1	2	2	1	3	3

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 $52 000, of which $21 300 will be required to cover salary and other price increases and $30 700 represents a programme increase.

M.2. The programme increase of $29 000 in respect of salaries for established posts and common staff costs is due to the addition of one P-4 post in 1977. Programme increases amounting to a total of $2600 are foreseen in respect of consultants' services, overtime and temporary assistance, and $3600 in respect of travel. A programme reduction of $10 500 in respect of technical committees and advisory groups will be possible although the same number of meetings will be held in 1977 as in 1976.

M.3. In respect of common services, supplies and equipment for which no provision was made in 1976, an amount of $1000 is foreseen for 1977. In view of the expanding activities it is expected that there will be a programme increase of $4000 in respect of linguistic services and $1000 for printing and publishing services. Staff engaged in other programmes will continue to give direct support to the same extent as foreseen for 1976. The support will again consist of half a Professional man-year provided under the "Nuclear safety and environmental protection" programme and half a Professional man-year of legal and external relations services under the "Administration" programme.

Manpower

M.4. As can be seen from Table M. 2 above, the addition of one P-4 post is foreseen for 1977. In view of the increased activities and the importance of this programme there is a need to add a full-time staff member in addition to the part-time support given by several staff members from outside the programme. It is foreseen that in 1977 the work will further increase and that the Board of Governors will hold several meetings on various aspects of PNE. No further change in the manning table is foreseen for 1978.

THE PROGRAMME

OBJECTIVE

M.5. 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 and the health and safety aspects involved and to respond to requests for PNE-related services.

RESULTS TO DATE

M.6. 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.

M.7. Four 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 Panel Proceedings series. In addition, a meeting has been held on the international observation of PNE projects by the Agency.

A working group was convened in April 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 potential PNE projects.

PLANS FOR 1977-78

M.8. It is expected that the information exchange conducted through the technical meetings on the phenomenology and practical aspects of PNEs, the fifth of which is scheduled for late this year, will continue through a sixth such meeting in 1978, if justified by Member States' interest and technological advances.

M.9. Reports summarizing the status of PNEs and covering economic aspects, health and safety and environmental aspects and legal aspects - which the Ad Hoc Advisory Group on the Peaceful Uses of Nuclear Explosions is expected to have prepared by the end of this year - will probably require continual up-dating, starting in 1977 (Advisory Group - Annex II (83)), with revised versions based on new information. Likewise, a bibliography of publications on PNEs, which is being issued this year, will be revised at two-yearly intervals.

M.10. The development of procedures to be used by the Agency in the later stages of PNE projects will be initiated in 1977 (Advisory Group - Annex II (84)).

PLANS FOR 1979-82

M.11. The Agency's activities in the field of information exchange will continue through further technical committee meetings or through smaller meetings of experts on specific topics.

M.12. The reports on the status of PNEs and the PNE bibliography will be up-dated when necessary.

M.13. The development of procedures to be used by the Agency in the later stages of PNE projects will continue.

N. SAFEGUARDS

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table N. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	2 375 032	3 158 000	280 000	277 000	557 000	3 715 000	4 382 000
Consultants	39 873	21 000	600	20 400	21 000	42 000	47 000
Overtime	205	1 000	-	1 000	1 000	2 000	2 000
Temporary assistance	862	-	-	5 000	5 000	5 000	5 000
Sub-total	2 415 972	3 180 000	280 600	303 400	584 000	3 764 000	4 436 000
Common staff costs	709 100	917 000	113 500	86 500	200 000	1 117 000	1 316 000
Travel	350 638	410 000	17 400	87 600	105 000	515 000	610 000
Meetings							
Conferences, symposia, seminars	36 659	-	-	30 000	30 000	30 000	55 000
Technical committees, advisory groups	37 342	67 000	3 500	13 500	17 000	84 000	76 000
Representation and hospitality	9 323	8 000	1 000	2 000	3 000	11 000	12 000
Scientific and technical contracts	143 902	490 000	10 000	(14 000)	(4 000)	486 000	550 000
Scientific supplies and equipment	406 217	510 000	41 000	27 000	68 000	578 000	543 000
Common services, supplies and equipment	44 226	-	-	-	-	-	-
Transfer of costs:							
Linguistic services	122 072	75 000	8 000	73 000	81 000	156 000	148 000
Printing and publishing services	57 541	69 000	6 000	5 000	11 000	80 000	90 000
Data processing services	151 175	125 000	13 000	262 000	275 000	400 000	500 000
Laboratory services	381 466	496 000	72 000	56 000	128 000	624 000	663 000
Other: Legal services	96 000	96 000	10 000	-	10 000	106 000	112 000
TOTAL	4 961 633	6 443 000	576 000 8,9%	932 000 14,5%	1 508 000 23,4%	7 951 000	9 111 000

SUMMARY OF MANPOWER

Table N. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
IG	1	1	1	-	1	1
D	2	3	3	1	4	4
P-5	19	24	24	4	28	30
P-4	33	36	36	5	41	48
P-3	35	33	33	1	34	36
P-2	11	5	5	(2)	3	3
Sub-total	101	102	102	9	111	122
GS	35	36	36	14	50	57
TOTAL	136	138	138	23	161	179

CHANGES IN COSTS AND MANPOWER

Costs

N.1. As will be seen from Table N.1 above, the cost of this programme is expected to increase by $1 508 000 in 1977, of which $576 000 will be required to cover salary and other price increases and $932 000 will be a programme increase.

N.2. A programme increase of $363 500 is foreseen in respect of salaries and related common staff costs for the additional nine Professional and 14 GS posts and for the up-grading of Professional posts.

N. 3. A programme increase of $6000 in respect of temporary assistance and overtime will be required for the new "Safeguards information treatment" sub-programme, and the increase of $20 400 in respect of consultants' services is also mainly attributable to that sub-programme.

N. 4. Of the programme increase of $87 600 in respect of travel, $70 000 is foreseen for inspection travel under the "Safeguards operations" sub-programme and $15 000 for the "Safeguards information treatment" sub-programme.

N. 5. The programme increase of $30 000 in respect of conferences, symposia and seminars is required because it is intended to hold in 1977 a safeguards training seminar on information handling. Five advisory group meetings and one Standing Committee meeting are planned for 1977, which is one meeting more than in the 1976 budget and explains the programme increase of $13 500. The increase of $2000 in respect of hospitality will partly be required for the additional meeting. A programme increase of $27 000 for scientific supplies and equipment will be partly offset by a programme reduction of $14 000 in respect of scientific and technical contracts.

N. 6. It is expected that there will also be increased requirements for support services which will result in programme increases of $73 000 for linguistic services, $5000 for printing and publishing services, $262 000 for data processing services and $56 000 for laboratory services. The latter is partly due to the apportionment of the construction costs of the annex to the laboratory, of which the share under the "Safeguards" programme is $38 000.

Manpower

N. 7. As will be seen from Table N. 2 above, nine additional Professional and 14 additional GS posts are foreseen for 1977. In addition it is planned to replace two P-2 posts by two P-4 posts to allow the Division of Operations to recruit appropriately qualified and experienced staff to apply safeguards at the more complex nuclear facilities. For 1978 eleven additional Professional and seven additional GS posts are expected to be needed.

N.8. Of the above increase four Professional and four GS posts are for the Division of Operations in 1977 and 11 Professional and seven GS posts in 1978. The increase of Professional posts in 1977 and 1978 is based on the normal growth of safeguarded nuclear materials, especially the increasing throughput of reprocessing and fuel fabrication plants and the start-up of new nuclear power plants. Two of the additional GS posts are needed for nuclear material accounting and two for clerical support.

N. 9. In July 1975 a data processing task force was established to ensure effective utilization of the computer-based safeguards information system. This year the task force has been converted into an information treatment unit and manned by the transfer of one P-5, three P-4, one P-3 and three GS posts from the Division of Operations, and one P-4, one P-3 and one GS post from the Division of Development. In view of the need for expansion in scope and size of the information treatment system it is proposed to establish a division of information treatment in 1977. The additional posts needed will

be one D post for the Director of the division, four Professional posts (two P-5 posts, one P-4 and one P-3 post) for systems analysts/programmers and ten GS posts for programmers, data preparation clerks, input-output editors and documentalists.

THE PROGRAMME

OBJECTIVE

N.10. The objective is to apply safeguards under agreements to which the Agency is a party. This involves the establishment of safeguards concepts and criteria, the implementation of established safeguards procedures and practices and the co-ordination and furtherance of development leading to the achievement of the safeguards objective in the most efficient way.

RESULTS TO DATE

N.11. So far 127 safeguards agreements (25 project agreements, 32 transfer agreements, 13 unilateral submission agreements and 57 agreements in connection with NPT) have been concluded. All of them have been or are being implemented, except for 29 NPT agreements with States which do not have significant peaceful nuclear activities.

PLANS FOR 1977-82

N.12. According to revised estimates which take into account the fact that the application of Agency safeguards in the non-nuclear-weapon Member States of EURATOM is starting about two years later than anticipated, the amount of nuclear material subject to safeguards under agreements with the Agency is expected to increase from 7000 effective kilograms in 1975 to 9000 effective kilograms in 1976 if one excludes the nuclear material in those States or to 19 000 effective kilograms if one includes it; if one includes also the nuclear material which will be subject to Agency safeguards in the United Kingdom and the United States, pursuant to the voluntary offers made by those countries, the amount of nuclear material subject to safeguards under agreements with the Agency is expected to rise to 62 000 effective kilograms in 1977 and to 130 000 effective kilograms in 1982.

N.13. The estimates for 1980-82 have been considerably reduced because of delays in the initiation of many nuclear power projects.

CO-OPERATION WITH OTHER ORGANIZATIONS

N.14. The programme involves co-operation with national and regional nuclear energy authorities.

STRUCTURE

N.15. This programme consists of four sub-programmes, which are dealt with separately below. The Inspector General assures the overall co-ordination and direction of the two Divisions of Operations, the Division of Development, the Section for Standardization and Administrative Support and the Safeguards Information Treatment Unit, each of which is involved in an interconnected manner in all four sub-programmes. It is expected that, during the programme period 1977-82, the Standing Advisory Group on Safeguards Implementation will continue to evaluate the technical objectives of safeguards, assess the effectiveness of safeguards and give advice on operational techniques (Standing Advisory Group - Annex II (90)).

Summary of manpower and costs by sub-programme

Table N. 3

Sub-programme	1977 Estimate			1978 Preliminary estimate		
	Man-years P	Man-years GS	Costs	Man-years P	Man-years GS	Costs
Programme co-ordination	2,0	3,0	773 000	2,0	3,0	745 000
Safeguards operations	74,0	21,0	3 771 000	85,0	28,0	4 653 000
Safeguards development	20,0	8,0	2 089 000	20,0	8,0	2 264 000
Standardization	3,0	4,0	197 000	3,0	4,0	214 000
Safeguards information treatment	12,0	14,0	1 121 000	12,0	14,0	1 235 000
TOTAL	111,0	50,0	7 951 000	122,0	57,0	9 111 000

Programme co-ordination

Summary by programme components

Table N. 4

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Programme co-ordination	2.0	3.0	158 500	5 000	-	590 500	754 000
Linguistic, printing and publishing services	-	-	-	-	-	19 000	19 000
TOTAL	2.0	3.0	158 500	5 000	-	609 500	773 000

SUB-PROGRAMMES

Safeguards operations

Summary by programme components

Table N. 5

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Safeguards operations	74,0	21,0	2 925 500	-	-	443 500	3 369 000
Linguistic, printing and publishing services	-	-	-	-	-	96 000	96 000
Laboratory services	-	-	-	-	-	200 000	200 000
Legal services	-	-	-	-	-	106 000	106 000
TOTAL	74,0	21,0	2 925 500	-	-	845 500	3 771 000

OBJECTIVE

N.16. The objective is to apply safeguards pursuant to agreements in connection with NPT 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)[N. 1]. The main activities involved in fulfilling this objective will include:

(a) Collection and evaluation of design information;

(b) Evaluation of nuclear material accountancy;

(c) Performance of inspections for the purpose of verifying information received from States;

(d) Preparation and formulation of technical conclusions on nuclear material accountancy;

(e) Technical preparation of subsidiary arrangements; and

(f) Elaboration and up-dating of Safeguards Implementation Practices (SIPs).

RESULTS TO DATE

N.17. Safeguards are at present being applied under 11 project agreements, 21 safeguards transfer agreements, 8 unilateral submission agreements and 23 agreements pursuant to NPT at 43 power plants, 103 research reactors and critical facilities and 169 other facilities and locations in 43 States.

N.18. During the past six years over 2200 inspections were carried out, statements on the technical conclusions being presented to the Governments of the States concerned.

N.19. Several safeguards training courses have been held and over 40 inspectors have received instruction in the basic principles and practices of Agency safeguards operations. Courses designed to up-date the knowledge and skills of experienced inspectors have also been held.

N.20. So far, SIPs have been elaborated for 76 facilities.

PLANS FOR 1977-78

N.21. It is expected that in 1977 safeguards will be implemented in 33 States having nuclear material subject to agreements pursuant to NPT and in 14 States having nuclear material subject to other agreements.

N.22. It is currently estimated that in 1977 safeguards will extend to nuclear material in 506 facilities. Since the type and number of facilities to be covered by agreements pursuant to the voluntary offers of the United Kingdom and the United States are not yet known, the following table does not include facilities in those countries.

[N. 1] Reproduced in document INFCIRC/66/Rev. 2.

Facilities subject to safeguards
1975-1977

Table N. 6

Type of facility	1975		1976		1977		1977 Total
	Transfer and project agreements	NPT agreements	Transfer and project agreements	NPT agreements	Transfer and project agreements	NPT agreements	
Power plants	25	18	14	63	18	69	87
Conversion plants	1	1	-	4	-	4	4
Fuel fabrication plants	6	3	2	19	2	19	21
Reprocessing plants	1	-	1	5	1	5	6
Enrichment plants	-	1	-	2	-	2	2
Pilot conversion plants	3	-	-	3	-	3	3
Pilot fuel fabrication plants	8	2	3	7	3	7	10
Pilot reprocessing plants	3	-	4	-	4	-	4
Research reactors and critical facilities	56	47	35	135	35	135	170
Sub-critical facilities	-	5	-	8	-	8	8
Research and development facilities	22	12	3	56	3	56	59
Other locations	71	30	13	119	13	119	132
TOTALS	196	119	75	421	79	427	506

a/ The differences between the figures for 1975 and 1976 are due mainly to the placing of facilities in the non-nuclear-weapon Member States of EURATOM under Agency safeguards and to changes made on the assumption that Japan's facilities will be transferred to NPT safeguards.

N.23. In addition to the increase arising out of the application of safeguards to facilities in the United Kingdom and the United States, the work load is expected to increase in 1978 as a result of the expansion of nuclear activities in States having safeguards agreements with the Agency.

N.24. The programme of induction and refresher courses for inspectors will continue through 1978.

N.25. SIPs will have to be established for facilities not so far covered and all SIPs will have to be kept under constant review.

RELATED ACTIVITIES

N.26. The Seibersdorf Laboratory will support this sub-programme in two ways: firstly by carrying out analyses of the samples collected by inspectors, in its function as part of the network of safeguards analytical laboratories, and secondly by assembling, calibrating and servicing the surveillance, non-destructive analysis and other equipment used in the field by inspectors. The monitoring of personnel for radiation doses received on duty in the field will continue to 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 forecasts of trends in the nuclear industry compiled by the Division of Nuclear Power and Reactors will be utilized. The Legal Division will participate in the negotiation of safeguards agreements.

PLANS FOR 1979-82

N.27. During this period, which should see a continuing increase in the proportion of the world's energy demand being met by nuclear power, the inspectorate is expected to grow more slowly than the amount of nuclear materials under safeguards if the trend to larger nuclear installations continues and as more effective verification techniques and instruments become available.

N.28. The establishment of regional offices where it would result in savings and where the States concerned concur is foreseen.

N.29. A variety of training courses for inspectors will be held.

CO-OPERATION WITH OTHER ORGANIZATIONS

N.30. 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 and for the management of safeguarded facilities. The co-operation of States in providing training in specialized fields will continue to be sought.

Safeguards development

Summary by programme components

Table N. 7

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Safeguards development	20,0	8,0	959 200	79 000	486 000	53 800	1 578 000
Linguistic, printing and publishing services	-	-	-	-	-	87 000	87 000
Laboratory services	-	-	-	-	-	424 000	424 000
TOTAL	20,0	8,0	959 200	79 000	486 000	564 800	2 089 000

OBJECTIVE

N.31. The objective is to provide procedures, techniques and equipment for achieving the technical objectives of safeguards in the most effective and economical way. The main activities involved in fulfilling this objective will include:

(a) Direct support for operational activities through the development and optimization of safeguards methods, techniques and instrumentation;

(b) Assistance in preparing safeguards procedures;

(c) Assistance in planning inspections and evaluating the results; and

(d) Critical reviews of development work in the light of experience.

RESULTS TO DATE

N.32. Safeguards concepts have been defined and incorporated in safeguards agreements and subsidiary arrangements since 1969. Recommendations for States' systems of accounting for and control of nuclear material and for the physical protection of nuclear material have been formulated and up-dated.

N.33. The "Methods and Techniques" part of the Safeguards Manual has been published and distributed to Member States. The remaining parts - "Safeguards Objectives, Criteria and Requirements", "Nuclear Activities and Facilities", "Inspections", "Evaluation of Information" and "Statistical Concepts and Techniques" - are expected to be completed this year.

N.34. Procedures have been established for the inspection of facilities, the statistical evaluation of inspection data and the correlation of isotopic composition data.

N.35. Construction of the Safeguards Analytical Laboratory (SAL) at Seibersdorf has been completed, equipment has been procured and operation under a licence permitting the handling of samples containing limited amounts of uranium has started. Two Process Analysis Field Experiments (PAFEXs) have been carried out with the collaboration of 11 laboratories in Member States. Further progress has been made in the development and field testing of compact, portable non-destructive assay equipment for the identification of feed and product materials in the fuel cycle and for the determination of their enrichment and isotopic composition. The development of optical and other instrumental methods and techniques for the implementation of containment and surveillance measures has continued and been extended to include TV systems.

PLANS FOR 1977-78

N.36. The quantitative description of the flow and inventory of nuclear material throughout the world will be up-dated continuously; the next up-dated description will be published in 1977.

N.37. Quantitative results obtained in applying safeguards will be continuously evaluated and used in studies aimed at:

(a) A critical review of the adequacy of safeguards implementation (Advisory Group - Annex II (89)); and

(b) Establishing the most economic and acceptable verification strategies (including the planning of inspections, the application of procedures and techniques, and the overcoming of limitations) for achieving a defined objective (Advisory Group - Annex II (85)).

N.38. With the help of statistical techniques, support for operational activities will be given in:

(a) Planning inspections;

(b) Evaluating and correlating data provided by States and obtained through inspections and from the network of safeguards analytical laboratories; and

(c) Drawing conclusions from inspection results.

N.39. Operational activities will also be supported through:

(a) Provision of field operation manuals on newly developed techniques and instruments;

(b) Calibration, installation and maintenance of instruments; and

(c) Training of inspectors in the application of newly developed procedures and techniques.

N.40. In the further development of methods and techniques, the main emphasis will be placed on:

(a) Provision of portable instruments and of techniques for the non-destructive determination of the quantity and isotopic composition of plutonium and uranium in different types of nuclear fuel (Advisory Group - Annex II (88)).

(b) Provision and use of authentic physical standards for the quantitative non-destructive analysis of nuclear material;

(c) Unattended surveillance of the containment, flow and inventory of nuclear material;

(d) Automation of nuclear material measurements at fuel fabrication and reprocessing facilities; and

(e) Correlation of isotopic data obtained from different points in the fuel cycle and comparison with relevant historical data (if available) for strengthening safeguards verification (Table N. 10, No. 1).

N.41. Instruments will be further developed, tested and demonstrated with a view to:

(a) Simpler operation, interpretation of results and maintenance under field conditions;

(b) Achieving greater portability through reduced size and weight (for example, in the case of multichannel analysers and high-resolution semiconductor detectors for gamma spectrometry);

(c) Achieving high resolution and dispensing with the need for cooling during use or storage (in the case of gamma ray detectors); and

(d) Providing, automatically, instantaneous and continuous information relating to nuclear material quantities and to the surveillance of containment and flow.

N.42. The formulation and refinement of technical specifications for the design and development of safeguards instruments will continue.

N.43. Typical safeguards procedures will continue to be developed, tested, demonstrated and reviewed (Advisory Group - Annex II (87)).

N.44. Criteria for assessing the effectiveness of States' systems of accounting for and control of nuclear material and its influence on the Agency's inspection effort and for assessing the effectiveness of facility operators' containment measures and its influence on safeguards strategies will be formulated.

N.45. A set of physical and chemical standards and a stock of reference materials will be established, kept up to date and provided for use in inspections and at safeguards analytical laboratories.

N.46. Procedures for optimizing the use of chemical analysis in nuclear material accountancy (including procedures for sampling, for sample transport and for the operation and control of the network of safeguards analytical laboratories) will be established (Table N.10, No. 2).

N.47. The usefulness and reliability of results obtained with equipment installed by facility operators for Agency verification purposes will be investigated.

N.48. Technical support will be provided to assist Member States in establishing their systems of accounting for and control of nuclear material and their systems for the physical protection of nuclear materials and facilities (Advisory Group - Annex II (86)). A safeguards training seminar will be held in 1977 (Seminar - Annex I (26)). The Agency's safeguards activities will be co-ordinated with related States' activities.

N.49. The Safeguards Technical Manual will be continuously up-dated.

N.50. A symposium will be held in 1978 on experience and new developments in nuclear material accountancy and control, inspection procedures and the development of safeguards techniques and instrumentation (Symposium - Annex III (14)).

N.51. Research contracts concerning mainly the development of instrumentation and methods will be concluded with appropriate research and development establishments in Member States.

RELATED ACTIVITIES

N.52. Analytical samples containing fissile material will be stored and handled, physical standards developed and reference materials for the calibration and testing of portable and transportable non-destructive assay equipment prepared at the Seibersdorf Laboratory. The planning of analytical experiments in the field and the administration of the network of safeguards analytical laboratories will be carried out at SAL. Training courses for personnel connected with States' systems of accounting for and control of nuclear material will be repeated in 1977 and 1978.

PLANS FOR 1979-82

N.53. Emphasis will be placed on developing techniques and instrumentation with a view to keeping abreast of technological advances. The safeguards aims, criteria, procedures and technologies set forth in the Safeguards Technical Manual will be reviewed constantly in the light of the experience gained in safeguards implementation.

CO-OPERATION WITH OTHER ORGANIZATIONS

N.54. This sub-programme involves co-operation with the laboratories and research and development organizations of national and regional nuclear energy authorities.

Standardization

Summary by programme components

Table N. 8

Programme component	Man-years P	Man-years GS	1977 Cost estimates Staff	Meetings	Contracts	Other	Total
Standardization	3.0	4.0	188 800	-	-	200	189 000
Linguistic, printing and publishing services	-	-	-	-	-	8 000	8 000
TOTAL	3.0	4.0	188 800	-	-	8 200	197 000

OBJECTIVE

N.55. The objective is to ensure efficiency and standardization in arrangements with State authorities for the implementation of safeguards agreements, to codify safeguards procedures and to lend logistical support in the application and administration of safeguards. The main activities involved in fulfilling this objective will include:

(a) Co-ordinating the preparation of the subsidiary arrangements of safeguards agreements;

(b) Preparing model arrangements;

(c) Participating in the negotiation of agreements and arrangements to ensure the consistency of technical and administrative/legal requirements; and

(d) Codifying the administrative procedures for safeguards implementation.

RESULTS TO DATE

N.56. Previously elaborated subsidiary arrangements have been reviewed and amended to reflect experience gained in their implementation and to take account of conditions in the States concerned, including the existence of national systems of nuclear material accountancy and control. More model facility attachments, forming parts of subsidiary arrangements, have been worked out. Work on the internal administrative manual for safeguards has continued.

PLANS FOR 1977-78

N.57. As new nuclear facilities are completed, the necessary facility attachments will be prepared and discussed with national authorities, the aim being that they should reflect up-to-date operating methods and safeguards procedures. Subsidiary arrangements already concluded will be reviewed and amended to conform to the latest standards. Administrative procedures for the application of safeguards and for the evaluation of safeguards results will continue to be developed, codified and elaborated. The logistical support in the application of safeguards will grow in scope and importance.

PLANS FOR 1979-82

N.58. The entire administrative system, including subsidiary arrangements, establishing conditions for the implementation of safeguards agreements will need continuous review and streamlining in the light of experience and of advances in nuclear and safeguards technology.

As new facility attachments are completed, standardization work will become more intensive and a continuous review of old subsidiary arrangements will be called for. Codification of the procedures for administrative support will continue.

Safeguards information treatment

Summary by programme components

Table N. 9

Programme component	Man-years		1977 Cost estimates				
	P	GS	Staff	Meetings	Contracts	Other	Total
Safeguards information treatment	12.0	14.0	649 000	30 000	-	16 000	695 000
Linguistic, printing and publishing services	-	-	-	-	-	26 000	26 000
Data processing services	-	-	-	-	-	400 000	400 000
TOTAL	12.0	14.0	649 000	30 000	-	442 000	1 121 000

OBJECTIVE

N.59. The objective is to develop further, document and operate the system for treating safeguards information. The main activities involved in fulfilling this objective will include:

(a) Continuation of the design, development, documentation and implementation of procedures and computer programs for treating safeguards information;

(b) Co-ordination and facilitation of the flow of safeguards information;

(c) Operation of input editing, computer program and output control services and provision of training in connection with safeguards information treatment;

(d) Provision of assistance in the evaluation of accountancy information and verification results.

RESULTS TO DATE

N.60. A computer-based data processing system for the treatment of accounting reports which relate to facilities described in design information submitted to the Agency and state inventories and movements of nuclear material under NPT safeguards has been under development for several years. The system, which is already being utilized in part, is also being tested and extended.

N.61. In order to achieve effective utilization of the system and make use of the experience gained so far, a task force grouping together the staff from the Divisions of Operations and Development concerned with automatic data processing was formed within the Department of Safeguards and Inspection on 1 July 1975. This task force has succeeded in increasing the effectiveness with which the system is being used and has started formulating plans for a longer-term effort aimed at the development of a comprehensive safeguards information treatment system which will also handle all data collected by inspectors and provide for their automatic evaluation.

N.62. The first seminar for the personnel of States' systems of accounting for and control of nuclear material who are concerned with reporting to the Agency pursuant to the provisions set forth in document INFCIRC/153 was held in December 1975, the principal aim being to teach the participants to prepare reports in such a way that they can enter the information treatment system smoothly.

N.63. By 1 January 1976, more than 3500 NPT nuclear material accounting reports (containing more than 60 000 accounting data records) had been introduced into the computer-based data bank and the rate of information input had reached more than 150 accounting reports (containing more than 2000 data records) per month.

PLANS FOR 1977-78

N.64. The safeguards information treatment system will be extended so that it can handle a greater volume and additional types of data. In particular, all kinds of information collected by inspectors will be prepared for computer processing, the results of which will be made available to the Divisions of Operations and Development.

N.65. It is estimated that the system will handle about 10 000 nuclear material accounting reports in 1977 and about 12 000 in 1978. In addition, it is expected that considerable information on analytical results and other inspection data will be introduced, stored and processed.

N.66. The following steps are envisaged for meeting the long-term objective:

(a) Review and adaptation of data base management systems;

(b) Co-operation with the Division of Operations in defining information needs, with the Division of Development in ensuring the use of the best available safeguards technology and with the Section for Standardization and Administrative Support in formulating uniform information requirements and codes;

(c) Definition, development and implementation of specific computer program modules;

(d) Extension and maintenance of user and programmer documentation; and

(e) Development and implementation of more efficient input methods.

N.67. Workshops will be held to inform users of the safeguards information treatment system of how it is being adapted to changing needs and of how to make optimum use of it.

RELATED ACTIVITIES

N.68. Because operation of the safeguards information treatment system will result in a significant increase in computer requirements, co-operation with the Computer Section in the field of processing hardware and software and for scheduling computer usage is essential.

PLANS FOR 1979-82

N.69. Adaptation and expansion of the safeguards information treatment system will continue and maintenance of the co-operation necessary for ensuring its effectiveness will be maintained. The activities described under "Plans for 1977-78" will continue.

CO-OPERATION WITH OTHER ORGANIZATIONS

N.70. Many States already have computerized nuclear material accounting systems and more such systems will be developed. It is essential to ensure compatibility, to minimize the loss of necessary information and to avoid duplication of effort.

Co-ordinated research programmes

Table N. 10

Co-ordinated programme title	Number of		Year initiated	Probable year of termination
	Contracts	Agreements		
1. Bank of correlated isotopic data	-	4	1975	1979
2. Control of quality of analytical services for safeguards	This programme has been approved but no contract has yet been awarded			

O. ADMINISTRATION

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table O.1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	2 308 894	2 449 000	215 000	123 000	338 000	2 787 000	3 044 000
Consultants	24 680	1 300	-	48 700	48 700	50 000	46 000
Overtime	2 288	3 700	1 100	(1 600)	(500)	3 200	3 400
Temporary assistance	21 959	11 600	2 100	9 800	11 900	23 500	31 100
Sub-total	2 357 821	2 465 600	218 200	179 900	398 100	2 863 700	3 124 500
Common staff costs	688 995	715 200	84 600	37 400	122 000	837 200	916 900
Travel	41 351	35 000	2 200	5 500	7 700	42 700	41 700
Meetings							
Technical committees, advisory groups	-	-	-	15 000	15 000	15 000	-
Representation and hospitality	10 041	12 400	800	700	1 500	13 900	14 900
Common services, supplies and equipment	122 383	185 800	(7 000)	(2 800)	(9 800)	176 000	169 500
Other items of expenditure	64 781	90 000	4 500	(9 000)	(4 500)	85 500	90 500
Transfer of costs:							
Linguistic services	244 822	299 000	30 000	(67 000)	(37 000)	262 000	316 000
Printing and publishing services	207 109	200 000	17 000	40 000	57 000	257 000	260 000
Data processing services	334 865	414 000	34 000	(156 000)	(122 000)	292 000	298 000
To other:							
PNE	-	(28 000)	(2 000)	-	(2 000)	(30 000)	(32 000)
Safeguards	(96 000)	(96 000)	(10 000)	-	(10 000)	(106 000)	(112 000)
TOTAL	3 976 168	4 293 000	372 300 8.7%	43 700 1.0%	416 000 9.7%	4 709 000	5 088 000

SUMMARY OF MANPOWER

Table O.2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
DDG	1	1	1	-	1	1
D	6	6	6	-	6	6
P-5	14	14	14	-	14	14
P-4	12	12	12	1	13	13
P-3	11	11	11	-	11	11
P-2	9	9	9	2	11	12
P-1	5	5	5	(2)	3	3
Sub-total	58	58	58	1	59	60
GS	86	88	89	7	96	99
TOTAL	144	146	147	8	155	159

CHANGES IN COSTS AND MANPOWER

Costs

O.1. As will be seen from Table O.1 above, it is expected that the cost of this programme will increase by $416 000, of which $372 300 will be required to cover salary and other price increases and $43 700 is a programme increase.

O.2. A programme increase of $160 400 is foreseen in respect of salaries and related common staff costs for one Professional and four GS posts in the Division of Budget and Finance, one GS post for the Division of External Relations and two GS posts for the Division of Personnel. It is also expected that the savings in respect of vacant posts and delays in recruitment will be lower in 1977 than assumed in the budget estimates for 1976.

O.3. In the Office of the Deputy Director General for Administration the services of a chief security officer will be provided by a consultant, and additional consultants' services will be required in the Division of Personnel to carry out job classification and salary surveys. This is reflected in the programme increase of $48 700 for this item. The programme increase of $9800 in respect of temporary assistance represents the additional requirements of the Office of the Deputy Director General and the Division of Personnel. A reduction of overtime requirements ($1600) is foreseen mainly in the Division of Budget and Finance.

O.4. Of the programme increase of $5500 in respect of travel, about one half will be required by the Division of External Relations and the other half by the Office of the Deputy Director General, the Office of Internal Audit and the Division of Personnel.

O.5. The programme increase of $15 000 in respect of technical committees and advisory groups is required because the Legal Division intends to hold an advisory group meeting in 1977. The increased requirement for hospitality is partly attributable to this meeting.

O.6. It is expected that there will be a small programme decrease of $2800 in respect of common services, supplies and equipment as a net result of a programme increase in respect of medical services, supplies and equipment in the Division of Personnel and a reduction under this item in the Division of External Relations. The latter is attributable to the decision to budget for mailing costs of publications (e.g. Bulletin, press releases) under printing and publishing services and not under common services, supplies and equipment.

O.7. The programme reduction of $9000 in respect of other items of expenditure is related to the Agency's contributions to inter-agency activities. The requirements for 1976 had been over-estimated due to lack of detailed information in respect of the International Civil Service Commission and discontinuance of direct payments to ILO for its services.

O.8. In respect of the apportionment of support costs, it is expected that there will be a programme reduction of $67 000 for linguistic services, mainly in the Legal Division. The programme increase of $40 000 in respect of printing and publishing services reflects mainly the switch of mailing charges from common services to this item. It is hoped that the reduced requirements for data processing services of the Divisions of Budget and Finance and Personnel will result in a programme decrease of $156 000 in respect of this item.

O.9. It is expected that income from UNIDO in respect of reimbursable services rendered by the Joint IAEA/UNIDO Medical Service will amount to $120 000 for 1977.

Manpower

O.10 As will be seen from Table O.2 above, the addition of one post at the Professional level and of seven GS posts is foreseen.

O.11 In the Division of Budget and Finance, the up-grading of one P-1 post to the P-2 level and the addition of one P-4 post and of four GS posts is required. The Professional post will be required to start a policy and procedures staff to do work outside the mainstream of the Division's day-to-day work, e.g. flow-charting of the current accounting system, developing cash flow projections and numerous other tasks. The four additional GS posts will be required for clerical staff in the Treasury and Technical Assistance Accounts Units and for additional typists in view of the workload demands, which have had to be met by the utilization of temporary assistance in 1976.

O.12. In the Division of External Relations, the up-grading of a P-1 post to the P-2 level and the addition of one GS post for the conference service will be required. Two additional GS posts will be required in the Division of Personnel to cope with the increasing workload.

O.13. For 1978 the addition of one P-2 post and of 2 GS posts is foreseen in the Division of Budget and Finance. The Division of Personnel will require an additional GS post.

THE PROGRAMME

OBJECTIVE

O.14. 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 (see paragraphs Q. 5 to Q. 9 below) and the "General services" programme (see paragraph P.10 below). 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

O.15. This programme consists of five sub-programmes, which are dealt with separately below.

Summary of total costs by organization unit

Table O.3

Organization unit	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Office of the Deputy Director General for Administration	195 229	231 300	21 200	56 500	77 700	309 000	332 000
Office of Internal Audit	202 509	221 100	29 500	10 400	39 900	261 000	304 000
Division of Budget and Finance	1 226 983	1 371 500	82 000	(40 500)	41 500	1 413 000	1 574 000
Division of External Relations	1 161 024	1 191 100	121 000	75 900	196 900	1 388 000	1 482 000
Legal Division	353 029	376 400	29 100	(31 500)	(2 400)	374 000	379 000
Division of Personnel	837 394	901 600	89 500	(27 100)	62 400	964 000	1 017 000
TOTAL	3 976 168	4 293 000	372 300	43 700	416 000	4 709 000	5 088 000

Summary of manpower by organization unit and category

Table O.4

Organization unit	1975 Adjusted budget				1976 Adjusted budget				1977 Estimate				1978 Preliminary estimate			
	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	2	-	5	3	2	-	5	3	2	-	5
Office of Internal Audit	5	4	-	9	5	4	-	9	5	4	-	9	5	4	-	9
Division of Budget and Finance	16	30	-	46	16	32	-	48	17	36	-	53	18	38	-	56
Division of External Relations	16	21	-	37	17	21	-	38	17	22	-	39	17	22	-	39
Legal Division	8	5	-	13	8	5	-	13	8	5	-	13	8	5	-	13
Division of Personnel	10	24	-	34	9	25	-	34	9	27	-	36	9	28	-	37
TOTAL	58	86	-	144	58	89	-	147	59	96	-	155	60	99	-	159

SUB-PROGRAMMES

Office of internal audit and management services

OBJECTIVE

O.16. The objective is to assist the Director General in achieving the most effective and economic use of the Agency's resources by:

(a) Reviewing the Agency's financial transactions in order to ensure observance of established regulations and procedures;

(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.

Budget and finance services

OBJECTIVE

O.17. 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 economic use of available financial resources.

PLANS FOR 1977-82

O.18. 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 and Operational Budgets;

(d) 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

(e) Be responsible for establishing contracting policy, administering research-oriented contracts, and maintaining centralized records of Agency contracts and agreements.

O.19. 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. The primary purposes of this review will be to provide a basis for further evaluation and improvement as necessary of the integrity of the overall computerized system;

(b) Review the present system of financial control over activities outside Vienna (the Laboratory, the Trieste Centre and the Monaco Laboratory), and based on that review, develop and implement an improved system;

(c) Design and prepare a new monthly budget status report.

CO-OPERATION WITH OTHER ORGANIZATIONS

O.20. 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. It also maintains the financial records for special accounts with SIDA and the Soviet Union and for joint projects with GSF, ERDA and USDA.

Personnel services

OBJECTIVE

O.21. The objective is to:

(a) Advise the Director General on all personnel matters and administer the personnel programme throughout the Secretariat;

(b) Recruit the staff of the Secretariat in a manner that will ensure the optimum use of available manpower resources;

(c) Provide staff training and welfare services;

(d) Prepare documentation on personnel matters for the Board of Governors and the General Conference; and

(e) Co-operate with the respective units of the United Nations and the specialized agencies with a view to developing common personnel policies.

PLANS FOR 1977-82

O.22. The Division of Personnel will perform the following functions:

(a) Recruit and administer the international and local staff of the Secretariat, and also temporary staff when required. In order to improve the selection of candidates to fill Professional posts, wider circulation will be given to vacancy notices and special emphasis will be placed on gathering information on available resources of manpower;

(b) Implement the Agency's Staff Regulations and Rules and make proposals for the development of personnel policies and procedures, taking into account recommendations made within the United Nations common system;

(c) Develop and administer a classification system for existing and new posts within the Secretariat and, as required, organize studies to review the best use of available manpower;

(d) Keep under constant review local salaries and employment conditions to determine the proper grading and salaries of locally recruited staff;

(e) Provide for or co-ordinate the Agency's representation at meetings of the United Nations or other international bodies on personnel or staff matters;

(f) Provide staff welfare services, administer social security, medical and life insurance systems, and co-ordinate staff training programmes and activities;

(g) Administer the Joint IAEA/UNIDO Medical Service; and

(h) Advise the Director General on all personnel matters, including any actions or changes resulting from recommendations made within the United Nations common system.

CO-OPERATION WITH OTHER ORGANIZATIONS

O.23. Co-operation with UNIDO will continue, especially in view of the setting up of common services at the Permanent Headquarters. Close contacts will be maintained with the United Nations on all matters falling under the United Nations common system.

Legal services

OBJECTIVE

O.24. 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 [O. 1];

(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

O.25. This sub-programme consists of two components, which are described in the following paragraphs.

Safeguards

Plans for 1977-82

O.26. Work will continue on the negotiation of safeguards agreements to be concluded with Member States as well as with States which ratified NPT. Work will be carried out in the development of appropriate legal instruments for the establishment of regional nuclear fuel cycle centres, for the provision of peaceful nuclear explosion services and for the international physical protection of nuclear material. It may be necessary to convene advisory group meetings, during the period under review, for each of these subjects.

Nuclear law

Plans for 1977-82

O.27. Developments in the national and international regulatory requirements for the clearance of food irradiation as a processing technique will be reviewed jointly with the "Food and agriculture" programme, in co-operation with WHO and FAO, in 1977 for the purpose of achieving international standardization (Advisory Group - Annex II (91)). The framing of an appropriate legal instrument for establishing a system to achieve international standardization in dosimetry in the medical use of atomic energy will be undertaken in co-operation with WHO.

O.28. The Agency will co-operate with IMCO in developing procedures to be applied in cases of accidental release of radioactivity at sea arising from maritime operations.

O.29. In the field of third party liability for nuclear damage, a number of problems are likely to arise from the existence of two conventions, the Paris Convention of 1960 and the Vienna Convention of 1963 [O. 2], to which the contracting parties would not be the same. Further work will be carried out, in co-operation with OECD(NEA), with a view to exploring practical solutions for such problems. Depending on the opinion of the Standing Committee on Civil Liability for Nuclear Damage as to the feasibility of achieving a uniform and world-wide regime of nuclear liability, the Agency may be required to co-sponsor an international conference to this end. The Brussels Convention of 1962 on the Liability of Operators of Nuclear Ships [O.2] may be expected to come into force in the not too distant future. Should this occur in the early part of the period under review, the Agency may also have to co-sponsor a conference for the purpose of revising this Convention.

[O. 1] INFCIRC/15/Rev. 1.

[O. 2] Legal Series No. 4.

O.30. In co-operation with OECD(NEA) efforts will continue to be made to improve the computerization of information on nuclear law and related matters.

O.31. Training of officials of Member States in nuclear law and regulatory matters will be provided by means of in-service training and interregional seminars.

O.32. The provision of advisory services to developing countries in the establishment of regulatory bodies on atomic energy and in the elaboration of legislation and regulations for licensing and control of nuclear installations has become an important part of this component and is expected to be increasingly requested by Member States in connection with the planning and implementation of nuclear power projects.

External relations

OBJECTIVE

O.33. The Division's main tasks are:

(a) To maintain effective relations and promote efficient co-operation with the Governments of Member States, with the United Nations and its specialized agencies, and with other intergovernmental and non-governmental organizations whose work is related to that of the Agency;

(b) To keep the public informed of the Agency's activities through the media of newspapers, periodicals, radio, television and exhibitions; 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 1977-82

O.34. Advice will be given to the Director General and the Departments in the Secretariat on relations with Governments and with other organizations.

O.35. The Division will negotiate or assist in the negotiation of agreements, especially in connection with safeguards and NPT. 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 provide for or co-ordinate the Agency's representation at meetings of 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.

O.36. Through its offices at United Nations Headquarters in New York and in Geneva, permanent liaison will be maintained with the United Nations and with the Geneva-based organizations of the United Nations and with UNEP.

O.37. Information for the general public will continue to be provided through all media. Short television films will be produced in collaboration with UNIDO. Efforts will be made to facilitate public understanding of the safety and environmental aspects of the nuclear industry and of the role of nuclear power in view of the energy situation.

O.38. A special effort will be made to provide information on the Agency's work to selected institutions and groups, such as universities, public utilities, national federations of industry, trade unions, managers, government officials and economists. While maintaining an impartial attitude towards any controversial subjects concerning nuclear energy,

the Division will publish special booklets giving factual information concerning topical problems, their solutions, past experience, and promising fields of research. In particular, Member States in which nuclear power has just been introduced or is about to be introduced will be apprised of the various problems and public reactions in industrialized countries having nuclear power programmes, and the Agency's role in environmental protection will be stressed. The Agency will continue to publish the Bulletin at intervals of two months and the pamphlet, Science Features, the latter on a somewhat reduced scale.

O.39. The main topics in regard to which the Agency's role should continue to be publicized are the role of nuclear energy in the overall energy field, the impact of nuclear energy on the environment, the role of nuclear techniques in meeting the need for more food, and safeguards and physical protection.

O.40. The main event in the 1977 programme of scientific meetings will be the Conference on Nuclear Power and its Fuel Cycle, to be held at Salzburg. A special effort will be made to publicize that Conference, the twentieth anniversary of the establishment of the Agency in 1977, and the second NPT review conference in 1980.

O.41. 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 125.

P. GENERAL SERVICES

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table P. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	1 591 808	1 736 000	102 000	85 000	187 000	1 923 000	2 153 000
Consultants	-	-	-	24 000	24 000	24 000	-
Overtime	26 025	29 000	1 500	-	1 500	30 500	33 000
Temporary assistance	20 426	9 000	600	28 400	29 000	38 000	40 000
Sub-total	1 638 259	1 774 000	104 100	137 400	241 500	2 015 500	2 226 000
Common staff costs	474 688	504 400	47 300	26 000	73 300	577 700	646 800
Travel	108	500	-	100	100	600	1 000
Representation and hospitality	41	100	-	100	100	200	200
Scientific and technical contracts	8 000	50 000	-	(50 000)	(50 000)	-	-
Common services, supplies and equipment	1 355 745	1 224 000	190 000	52 000	242 000	1 466 000	1 483 000
Transfer of costs:							
Linguistic services	6 580	19 000	2 000	(12 000)	(10 000)	9 000	10 000
Printing and publishing services	102 775	86 000	7 000	15 000	22 000	108 000	120 000
Data processing services	48 463	22 000	-	(22 000)	(22 000)	-	-
TOTAL	3 634 659	3 680 000	350 400 9,5%	146 600 4,0%	497 000 13,5%	4 177 000	4 487 000

SUMMARY OF MANPOWER

Table P. 2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	1	1	1	1	2	2
P-4	2	2	3	(1)	2	2
P-3	4	4	3	-	3	3
P-2	1	1	1	-	1	1
Sub-total	9	9	9	-	9	9
GS	68	70	70	1	71	71
M&O	120	116	116	13	129	129
TOTAL	197	195	195	14	209	209

CHANGES IN COSTS AND MANPOWER

Costs

P.1. As will be seen from Table P.1 above, it is expected that the total cost of this programme will increase by $497 000 in 1977, of which $350 400 will be required to cover salary and other price increases and $146 600 represents a programme increase.

P.2. A programme increase of $111 000 is foreseen in respect of salaries and common staff costs for one GS post and 13 M&O posts; an increase of $28 400 will be required in respect of temporary assistance to service, at M&O level, additional temporary premises. The programme increase of $24 000 in respect of consultants covers the services of a procurement officer who will be required for a limited period in view of the workload resulting from the preparations for the move to the Permanent Headquarters.

P. 3. Since the estimates for 1977 in this programme do not include any provision for the Permanent Headquarters, there will be a programme decrease of $ 50 000 in respect of contractual services under the item scientific and technical contracts. Common services, supplies and equipment show a programme increase of $ 52 000 as a net result of an increase in the Agency's activities and the need for additional temporary office space and certain reductions in respect of repair and maintenance and acquisition of furniture and equipment in view of the impending move to the Permanent Headquarters.

P. 4. It can be expected that additional requirements for printing and publishing services of $ 15 000 will be almost offset by a decrease of $ 12 000 in respect of linguistic services. Since it is intended to charge the data processing services required for the mailing lists to the "Printing and publishing" sub-programme of the "Service activities" programme, a programme decrease of $ 22 000 is shown under this item.

Manpower

P.5. As will be seen from Table P.2 above, the up-grading of one P-4 post to P-5 and the addition of one GS post and 13 M&O posts are required for 1977.

P.6. The up-grading of the post of the Head, Special Services Section, has been recommended by an internal review group because of the responsibilities connected with the construction of the Permanent Headquarters, including negotiations with the Austrian authorities on all details concerning the new headquarters building.

P.7. In order to service the additional temporary office space put at the Agency's disposal at Wasagasse, one GS post will be required for a telephone technician and eight M&O posts will be needed for one handyman, four security guards, two messengers and one driver. Five additional M&O posts will be required at Headquarters for security guards.

P. 8. No further change in the manning table is foreseen for 1978.

Costs of common services, supplies and equipment

Table P. 3

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	1977 Estimate
Division of General Services			
Services			
Communications	335 512	327 000	451 000
Freight and transportation	37 162	37 000	54 000
Rental and maintenance of premises	130 831	133 000	154 000
Utilities	308 770	350 000	437 000
Rental and maintenance of furniture and equipment	140 890	125 000	155 000
Other	2 474	4 000	4 000
Sub-total	955 639	976 000	1 255 000
Supplies			
Building and maintenance supplies	82 283	93 000	30 000
Office supplies	85 002	67 000	80 000
Other	190 379	40 000	50 000
Expendable equipment	4 439	4 000	5 000
Sub-total	362 103	204 000	165 000
Equipment			
Building, property and maintenance equipment	9 399	4 000	1 000
Office furniture and equipment	28 024	33 000	40 000
Transportation equipment	580	7 000	5 000
Sub-total	38 003	44 000	46 000
TOTAL	1 355 745	1 224 000	1 466 000

OBJECTIVE

P.9. The objective is to ensure the provision of engineering, architectural and maintenance services for the Headquarters building, the Seibersdorf Laboratory, the Monaco Laboratory and the Trieste Centre, to provide registry and messenger services (including operation of the archives), purchasing and supply services, transportation services, security services, and housing and other staff services, and to operate the Agency's commissary and restaurant until the move to the Permanent Headquarters, and thereafter, to ensure the efficient operation of these common services. In the meantime, the main objective will be the completion of the Permanent Headquarters in accordance with the needs and requirements of the Agency, and the transfer of the Secretariat to the new premises.

PLANS FOR 1977-82

P.10. The Division of General Services will continue to provide the services and perform the functions set forth in the previous paragraph. Its main task will be related to the completion of the Permanent Headquarters, and the move to the new premises, as well as the setting up of common services in collaboration with UNIDO and the United Nations. Early in 1977 additional temporary premises for about 70 staff members will be made available, and action to transfer staff into the premises will then be taken.

Q. SERVICE ACTIVITIES

THE PROGRAMME

Q.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.

SUB-PROGRAMMES

Linguistic services

Costs of the sub-programme

Summary by items of expenditure: Table Q.1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	1 487 285	1 717 000	169 000	(44 000)	125 000	1 842 000	1 908 000
Overtime	9 886	11 000	700	13 300	14 000	25 000	27 000
Temporary assistance	257 408	562 500	45 800	36 700	82 500	645 000	703 000
Sub-total	1 754 579	2 290 500	215 500	6 000	221 500	2 512 000	2 638 000
Common staff costs	445 687	499 400	67 400	(13 000)	54 400	553 800	573 700
Travel	233	1 100	100	-	100	1 200	1 300
Scientific and technical contracts	-	26 000	3 000	71 000	74 000	100 000	132 000
Transfer of costs:							
Linguistic services	(2 200 829)	(2 817 000)	(286 000)	(65 000)	(351 000)	(3 168 000)	(3 346 000)
Printing and publishing services	330	-	-	1 000	1 000	1 000	1 000
TOTAL	-	-	-	-	-	-	-

Summary of manpower

Table Q.2

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	6	6	6	-	6	6
P-4	17	17	16	-	16	16
P-3	24	24	25	-	25	25
P-2	1	1	1	-	1	1
Sub-total	49	49	49	-	49	49
GS	38	38	38	-	38	38
M&O	1	1	1	-	1	1
TOTAL	88	88	88	-	88	88

CHANGES IN COSTS

Q. 2. As will be seen from Table Q. 1 above, the total cost of the linguistic services will be charged to the programmes for which those services are provided.

Q. 3. The programme decrease of $57 000 in respect of salaries and common staff costs results from delays in recruitment. A programme increase of $13 300 in respect of overtime and $36 700 in respect of temporary assistance is foreseen. An amount of $1000 will be provided to printing and publishing services. External contractual translation will be required to cope with the expected work load, which explains the programme increase of $71 000.

STRUCTURE

Q. 4. This sub-programme consists of two components, which are dealt with below.

Summary of costs by programme component

Table Q. 3

Programme component	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Interpretation services	405 828	846 000	76 000	(65 000)	11 000	857 000	930 000
Translation and records services	1 795 001	1 971 000	210 000	130 000	340 000	2 311 000	2 416 000
Sub-total	2 200 829	2 817 000	286 000	65 000	351 000	3 168 000	3 346 000
Less:							
Transfer to other programmes	(2 200 829)	(2 817 000)	(286 000)	(65 000)	(351 000)	(3 168 000)	(3 346 000)
TOTAL	-	-	-	-	-	-	-

Interpretation

Q. 5. 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.

Q. 6. The work of the interpretation services is expected to increase in the years immediately ahead owing to an increase in the number of meetings.

Translation and records

Q. 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.

Q. 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.

Q. 9. These activities are expected to increase in the years immediately ahead owing to an expansion of various programmes of the Agency.

Printing and publishing services

Costs of the sub-programme

Summary by items of expenditure: Table Q. 4

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Salaries and wages							
Established posts	1 408 550	1 482 000	112 000	6 000	118 000	1 600 000	1 740 000
Overtime	20 543	35 000	3 000	3 500	6 500	41 500	43 600
Temporary assistance	32 551	93 000	5 000	(1 000)	4 000	97 000	83 000
Sub-total	1 461 644	1 610 000	120 000	8 500	128 500	1 738 500	1 866 600
Common staff costs	421 764	430 300	48 000	2 000	50 000	480 300	523 200
Travel	600	2 500	100	(600)	(500)	2 000	4 000
Representation and hospitality	5	200	-	-	-	200	200
Scientific and technical contracts	6 695	3 000	300	1 700	2 000	5 000	5 000
Common services, supplies and equipment	606 356	620 000	20 000	88 000	108 000	728 000	648 000
Transfer of cost:							
Linguistic services	4 500	9 000	100	(3 100)	(3 000)	6 000	6 000
Printing and publishing services	(2 363 557)	(2 559 000)	(178 500)	(105 500)	(284 000)	(2 843 000)	(2 933 000)
Data processing services	-	24 000	3 000	16 000	19 000	43 000	50 000
TOTAL	138 007	140 000	13 000 9,3 %	7 000 5,0 %	20 000 14,3 %	160 000	170 000

Summary of manpower

Table Q. 5

Grade of post	Number of established posts					
	1975 Adjusted	1976	1976 Adjusted	Change	1977	1978 Preliminary estimate
D	1	1	1	-	1	1
P-5	1	1	1	-	1	1
P-4	1	1	-	-	-	-
P-3	5	5	5	1	6	8
P-2	4	4	4	3	7	6
P-1	4	4	4	(4)	-	-
Sub-total	16	16	15	-	15	16
GS	89	101	101	1	102	101
M&O	26	14	14	-	14	14
TOTAL	131	131	130	1	131	131

CHANGES IN COSTS AND MANPOWER

Costs

Q. 10. As will be seen from Table Q. 4 above, the cost of printing and publishing is charged to the programmes for which services are provided, except the reimbursable services provided for UNIDO under the IAEA/UNIDO services agreement, which remain as a charge against this programme.

Q. 11. The total cost of this programme is expected to increase by $304 000, of which $191 500 will be required to cover salary and other price increases, and $112 500 is a programme increase.

Q. 12. A programme increase of $8000 is foreseen in respect of salaries and common staff costs for one additional GS post in the Printing Section. An additional $3500 will be needed for overtime in the same Section. A programme decrease of $1000 is expected in the temporary assistance requirements.

Q. 13. A programme increase of $1700 expected for external contractual editing is partly offset by a programme reduction of $600 for travel. The programme increase of $88 000 in respect of common services, supplies and equipment is mainly attributable to the Conference on Nuclear Power and its Fuel Cycle and to the publication which will be issued in commemoration of the Agency's twentieth anniversary.

Q. 14. As regards the apportionment of costs, it is expected that the requirement for linguistic services will decrease, whereas the requirement for data processing services will increase. A programme increase of $16 000 for the latter will be needed for the computerized mailing list, for which actual charges are being made to the "General services" programme.

Q. 15. It is expected that income from the sale of Agency publications, not including INIS and CINDA publications, will amount to $450 000 in 1977. Income from UNIDO for printing services is expected to reach $160 000.

Manpower

Q. 16. As can be seen from Table Q. 5 above, the addition of one GS post will be required in 1977 to cope with the increased distribution workload. In the Publishing Section the up-grading of four P-1 posts to the P-2 level and of one P-2 post to the P-3 level is required for editing staff.

Q. 17. For 1978 the up-grading of one GS post to the P-2 level for the Chief of the Distribution Unit and the up-grading of two P-2 posts to the P-3 level for editing staff are needed.

STRUCTURE

Q. 18. This sub-programme consists of two components, which are dealt with below.

Summary of costs by programme component

Table Q. 6

Programme component	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Printing services	1 608 777	1 627 000	116 000	155 000	271 000	1 898 000	1 953 000
Publishing services	892 787	1 072 000	75 500	(42 500)	33 000	1 105 000	1 150 000
Sub-total	2 501 564	2 699 000	191 500	112 500	304 000	3 003 000	3 103 000
Less:							
Transfer to other programmes	(2 363 557)	(2 559 000)	(178 500)	(105 500)	(284 000)	(2 843 000)	(2 933 000)
Reimbursable services rendered to UNIDO	138 007	140 000	13 000	7 000	20 000	160 000	170 000

Printing services

Objective

Q. 19. The objective is to provide reproduction and distribution facilities to meet the requirements of the General Conference, the Board, the Secretariat (including the publications programme and INIS) and, to the extent possible, UNIDO and other international organizations on a reimbursable basis.

Plans for 1977-78

Q. 20. The volume of printing work will be determined by the activities of the Agency and UNIDO. In 1977 the documentation produced for symposia, conferences and international seminars prior to their being held will be double that of 1976 owing to the Conference on Nuclear Power and its Fuel Cycle which will require the reproduction of 325 preprints at a high print-run and in two languages, as well as a book of abstracts (500 pages) in all four languages. The usual reproduction demands resulting from the General Conference, the Board of Governors and its committees will also have to be met.

Plans for 1979-82

Q. 21. The larger and more efficient facilities at the Permanent Headquarters should make it possible to improve the reproduction and distribution services available to the Agency, UNIDO and other international organizations.

Publishing services

Objective

Q. 22. The objective is to prepare, publish and distribute Agency publications and to provide publication services for other international organizations, for example the United Nations, ILO, FAO, UNESCO and WHO, thus ensuring a wide dissemination of information on the peaceful uses of atomic energy in Member States as rapidly and economically as possible. About 1000 copies of each publication are provided free of charge to Member States per year, representing a sales value of $600 000. Revenues from sales help to cover publication costs.

Plans for 1977-78

Q. 23. The Division of Publications will publish the proceedings of the scientific meetings listed elsewhere in this document, as well as other books and journals reflecting the work of the Agency's scientific programmes. In particular the publication of the proceedings of the Conference on Nuclear Power and its Fuel Cycle, to be held in 1977, will constitute a major undertaking with an estimated output of 5000 pages representing about 25% of the normal annual edited output. Therefore, the estimated output of edited books, proceedings of symposia, conferences and seminars, reports of study tours, technical committees and working groups, proceedings of scientific meetings at the Trieste Centre, and journals (Nuclear Fusion and Atomic Energy Review) will be about 25 000 pages in 1977. Some increase over the average is also expected for 1978.

Q. 24. A continuous effort will be made to distribute Agency publications as extensively as possible. The sales operations will entail an increased work load equivalent to one third of the previous publications output as a result of the expansion of the ATOMINDEX. This requires streamlining of the sales operations by the installation of equipment for automated invoicing, stock-keeping, currency exchange operations, etc. A comprehensive publications catalogue, which is issued every second year, will be published in 1978.

Plans for 1979-82

Q. 25. The publications programme will continue to reflect the scientific work of the Agency.

R. ADJUSTMENT OF PROGRAMME COST ESTIMATES

Table R. 1

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Adjustment of programme cost estimates	-	2 300 000	(2 300 000)	-	(2 300 000)	-	-

CHANGES IN COSTS

R. 1. The cost estimates made in the earlier part of this programme budget are based on a rate of exchange of 18. 50 Austrian schillings to the United States dollar.

R. 2. Since it is expected that the exchange rate will remain about the same, no funds are included for 1977 in respect of "Adjustment of programme cost estimates".

S. TRANSFER OF THE AGENCY TO ITS PERMANENT HEADQUARTERS

COSTS OF THE PROGRAMME

Summary by items of expenditure: Table S.1.

Item of expenditure	1975 Actual obligations	1976 Adjusted budget	Increase or (decrease) from 1976			1977 Estimate	1978 Preliminary estimate
			Price	Programme	Total		
Common services, supplies and equipment	-	-	-	3 350 000	3 350 000	3 350 000	1 500 000
TOTAL	-	-	-	3 350 000	3 350 000	3 350 000	1 500 000

SUMMARY OF TOTAL ESTIMATED AGENCY COSTS BY MAJOR CATEGORY AND AREA

Table S.2.

Item by major category	Area			Total
	Conference Building	Office Tower	Common Services	
Office furniture	-	415 000	-	415 000
Library equipment	-	-	235 000	235 000
Simultaneous interpretation	638 000	332 000	-	970 000
Sound transmission of proceedings from conference rooms	98 000	12 000	-	110 000
Conference room furniture	476 000	119 000	-	595 000
Registry equipment	6 000	77 000	12 000	95 000
Beverage stations and service facilities	-	45 000	-	45 000
Special video equipment	-	190 000	-	190 000
Projection equipment	180 000	-	-	180 000
Purchase and supply storage equipment	-	-	35 000	35 000
Restaurant and kitchen equipment	-	-	765 000	765 000
Wired intercom, loudspeaker and alarm system	19 000	96 000	20 000	135 000
Security surveillance system	7 000	6 000	37 000	50 000
Direction and other signs	18 000	37 000	20 000	75 000
Engineering, building management and maintenance equipment	-	-	85 000	85 000
Commissary	-	-	170 000	170 000
Lounges with refreshment area	65 000	-	-	65 000
Medical	-	-	110 000	110 000
Sub-total	1 507 000	1 329 000	1 489 000	4 325 000
Moving cost	-	-	300 000	300 000
Unforeseen	75 000	65 000	35 000	225 000
TOTAL	1 582 000	1 394 000	1 874 000	4 850 000

Description of the facilities

S.1. As will be seen from Table S.2. above the total estimates of the expenditure to be incurred by the Agency in the purchase and installation of furniture and equipment in connection with the transfer of the Agency to its Permanent headquarters is at present foreseen to amount to $4 850 000, of which $3 350 000 is required in 1977 and $1 500 000 is projected for 1978. The principal reason for this split is that contracts for a significant portion of the equipment and other installations should be placed in 1977.

S.2. The General Conference will recall that in 1967 the Austrian Government offered to provide the Agency at the former's expense with the site and buildings for its Permanent Headquarters and that the Board agreed to accept the offer. The premises being constructed pursuant to this action are for the Agency and UNIDO and are designed to provide accommodation for approximately 4600 officials in four office towers, a conference area and two common services buildings. They will be located on a plot of some 23.7 hectares in the Donaupark area of Vienna, on the left bank of the Danube. There will be four Y-shaped office towers comprising some 61 000 m^2 of net usable office space and two similarly designed units comprising 42 000 m^2 of net usable space for common services. Conference rooms and related service areas comprising some 22 000 m^2 of net usable space will be provided in cylindrically-shaped building centrally located in the complex. Adequate parking and other amenities for delegates, staff and visitors will also be available.

S.3. In the course of consultations with the United Nations and the Austrian authorities concerning the most rational and economic use of the premises at the Donaupark, the Agency agreed that the smaller of the two towers originally allocated to it should be made available to provide permanent accommodation to meet the requirements of the United Nations.[1] The tower retained by the Agency will provide accommodation for about 1250 staff members. Further, certain of the staff will be housed in the Common Services Buildings and in the Conference Building. In addition, under the terms of the proposed agreement between the Austrian Government, the United Nations and the Agency, the Agency will have the prior right, subject to the requirements of the United Nations itself for its own purposes, to secure any additional accommodation it may need in the smaller tower when the actual allocation of office space in that tower is made.

S.4. The facilities in the IAEA-UNIDO Conference Building will consist of three large, two medium-sized, and four small conference rooms, or a total of nine. Lounges for delegates and offices for conference personnel are adjacent to the conference rooms. Originally these facilities were to have been shared equally by the Agency and UNIDO. In the course of the consultations referred to above, the Agency also reviewed its likely requirements for conference and meeting room facilities at the Donaupark. This review was made in relation to a United Nations study on the inclusion of Vienna (besides New York and Geneva) in the pattern of United Nations conferences. As a result of the review, the Agency decided to release to the United Nations all except one large room (for meetings of the Board of Governors) and two small conference rooms in the Conference area on the understanding that, subject to the United Nations' own priorities, the Agency might make use of the other meeting rooms on a cost-free basis. In addition, the Agency will have the exclusive use of three small conference rooms in its own Office Tower.

S.5. All the rooms referred to in the preceding paragraph will be equipped for simultaneous interpretation. Sixteen further meeting rooms will be available in the Agency's Office Tower for the Secretariat's own use but will not be equipped for interpretation.

S.6. The two Common Services Buildings will house a self-service cafeteria, a restaurant, printing facilities, a library, a computer service, telecommunications and procurement services, a mail and pouch service, maintenance shops, a commissary, the medical services, language classrooms and facilities and space for staff activities. UNIDO, in addition, wishes to have an area for visitors and guided tours.

[1] See General Assembly documents A/10348 of 17 November 1975 and A/10454 of 9 December 1975.

S.7. As regards laboratory activities now carried out at 11 Kärntner Ring, only the Hydrology Section, which deals with the measurement of natural radioactivity, will be located in the Donaupark. The other facilities will be moved to the Agency's present Laboratory at Seibersdorf and located in a new wing which is to be constructed by the Austrian authorities and an extension thereof for which provision has been made in the 1977 programme budget estimates.

Ownership and operation arrangement

S.8. The buildings will remain the property of the Austrian Government but will be leased for 99 years to the organizations for a symbolic rent of one Austrian schilling per annum. Fixed installations such as the heating and air-conditioning plant, the lifts, the telephone exchange, the horizontal and vertical conveyor systems for transporting mail and documents between buildings, the wiring for simultaneous interpretation and for other essential services and the buildings' central control system will be provided by the Austrian Government. Furniture and office equipment, the equipment needed for simultaneous interpretation, public address systems, the Restaurant and Cafeteria, the Joint Medical Unit, the Registry, the Library, and storage facilities will be the responsibility of the organizations in accordance with the original offer by the Austrian Government. Major maintenance will be the responsibility of the Austrian Government, but the cost of operating and guarding the buildings, as well as normal maintenance, will be the responsibility of the organizations. The allocation of responsibilities will be the subject of discussions with the Austrian Government.

Progress of construction work

S.9. Construction work has progressed to a point that the move to the Permanent Headquarters is expected to be completed during the first half of 1979. Taking into account the construction schedule and the related dates when certain equipment has to be delivered at site, cost estimates for the acquisition and installation of such equipment have been included in the Agency's budget proposals for 1977. At the same time, the preliminary estimates for 1978 reflect the appropriation that is foreseen to be necessary for that year.

Basis of estimates and summary thereof

S.10. The estimates for 1977 are in most cases based on the price level of 1975. In the case of low voltage equipment such as that for simultaneous interpretation the estimates are based on quotations which were made by reputable firms early in 1976. The estimates cover the costs pertaining to the Agency's Office Tower, its three conference rooms in the Conference Building and the Agency's portion of costs pertaining to the Common Services area which will be shared with UNIDO and the United Nations. These latter costs are based on the assumption that the Agency's share would be approximately one third, taking into account the expectation of actual usage.

S.11. The United Nations General Assembly at its thirtieth session authorized the Secretary-General to inform the Government of Austria that the United Nations was willing to consider the offer of space in the building known as Tower A-2 in the Donaupark project. It also expressed the opinion that no additional space should be acquired in New York or at Geneva until consideration had been given first to the use of available space in Vienna. The Secretary-General was requested, after taking into account the comments and suggestions made at the session, to prepare a report for submission to the Assembly at its thirty-first session, which would enable it to reach a decision on the matter.[2]

S.12. Estimates have been reported of the financial implications associated with the move of UNIDO and the United Nations to the Vienna International Centre. [3] An analysis of these estimates indicates:

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[2] A/RES/3529 (XXX).

[3] See General Assembly documents A/C.5/1725 of 26 November 1975 and A/10348 of 17 November 1975.

(b) In the statement of the financial implications for the United Nations of assuming responsibility for Tower A-2, an amount has been included which would increase its share of the cost of furnishing and equipping the Common Services Buildings to approximately two thirds including the share to be borne by UNIDO.

(a) That UNIDO will furnish and equip six conference rooms in the Conference Building and would bear approximately 70% of the other expenses in this area; and

The estimates of the cost which the Agency will have to bear are based on the assumption that the United Nations will assume responsibility for Tower A-2 and have accordingly been prepared taking the above-mentioned factors into account.

S.13. As mentioned above, the total estimated cost to the Agency for the transfer to its Permanent Headquarters is $4 850 000. The total appropriation needed in 1977 is $3 350 000 and the preliminary estimate for 1978 is $1 500 000. The major categories of expenditures in the total estimated cost are given by area in Table S.2 above. The appropriation request for 1977, broken down by major category and area, is given in Table S.3. below. The justification for the Agency's budget request, by each major category of equipment, follows immediately after Table S.3.

SUMMARY OF ESTIMATED AGENCY COSTS BY MAJOR CATEGORY AND AREA FOR 1977 AND 1978

Table S.3.

Item	1977				1978
	Conference Building	Office Tower	Common Services	Total	Preliminary
Office furniture	-	130 000	-	130 000	285 000
Library equipment		-	90 000	90 000	145 000
Simultaneous interpretation	638 000	332 000	-	970 000	-
Sound transmission of proceedings from conference rooms	98 000	12 000	-	110 000	-
Conference room furniture	408 000	102 000	-	510 000	85 000
Registry equipment	-	-	55 000	55 000	40 000
Beverage stations and service facilities	-	-	-	-	45 000
Special video equipment	-	190 000	-	190 000	-
Projection equipment	180 000	-	-	180 000	-
Purchase and supply storage equipment	-	-	15 000	15 000	20 000
Restaurant and kitchen equipment	-	-	610 000	610 000	155 000
Wired intercom, loudspeaker and alarm system	19 000	96 000	20 000	135 000	-
Security surveillance system	-	7 000	18 000	25 000	25 000
Direction and other signs	18 000	37 000	20 000	75 000	-
Engineering, building management and maintenance equipment	-	-	30 000	30 000	55 000
Commissary	-	-	70 000	70 000	100 000
Lounges with refreshment areas	-	-	-	-	65 000
Medical	-	-	-	-	110 000
Sub-total	1 361 000	906 000	928 000	3 195 000	1 130 000
Moving cost	-	-	-	-	300 000
Unforeseen	65 000	45 000	45 000	155 000	70 000
TOTAL	1 426 000	951 000	973 000	3 350 000	1 500 000

DETAILS OF EQUIPMENT AND COSTS

(expressed in United States dollars)

S.14. In the paragraphs that follow a brief description is given of the various items mentioned in the above tables.

(A) OFFICE FURNITURE.....	1977	$130 000
	1978	$285 000

S.15. All office furniture that is usable will be transferred to the International Centre. The replacement of other furniture will be made partially in 1976 and 1977 but the main purchase will be undertaken at the time of the move in order to have the new furniture delivered directly to the Permanent Headquarters.

Summary by item and cost[a/]

Item	Number	Unit cost	1977	1978	Total cost
Cabinets	610	170	34 000	70 000	104 000
Desks	520	207	30 000	77 000	107 000
Stands	640	48	10 000	21 000	31 000
Tables	700	87	21 000	40 000	61 000
Chairs	1 600	70	35 000	77 000	112 000
TOTAL			130 000	285 000	415 000

a/ Figures rounded to nearest thousand.

(B) LIBRARY EQUIPMENT.....	1977	$ 90 000
	1978	$145 000

S.16. The Agency's Library, its film library and the documents storage area have to be equipped with compact shelving. The Agency will bear the total cost for so equipping its Library and film library, and it will bear one third of the cost for the documents storage area. In addition, there will be required single-faced steel shelving units for films, single and double steel shelving units, wooden display units, microfiche equipment, single-seat carrels, two-seat carrels, and four-seat carrels.

Summary by item and cost

Item	1977	1978	Total cost
Compact shelving	90 000		90 000
Steel shelving		18 000	18 000
Wooden shelving		52 000	52 000
Carrels		45 000	45 000
Miscellaneous		30 000	30 000
TOTAL	90 000	145 000	235 000

1977 $970 000

(C) SIMULTANEOUS INTERPRETATION EQUIPMENT..... 1978 -

S.17. The cost under this heading provides for the interpretation equipment needed for six meeting rooms. Three of the rooms are in the Office Tower and three are in the Conference Building (the Boardroom and two additional meeting rooms on Level 5). Although the rooms are of different sizes and the equipment to be installed will vary, each room will be provided with central control distribution, switching units, microphones and headphones, and interpreters' units. In addition, language selector units for delegates, ear shells, recording equipment, and signalization and recording equipment between the Chair, the cabins, and the conference officer will be provided. The Austrian authorities have installed, at their cost, in each meeting room double flooring to provide for what is known as "infinitesimal flexibility" in the seating arrangements.

Summary by item and cost

Item	Meeting rooms			Total cost 1977
	Conference Building		Office Tower	
	Board	(2) Rooms	(3) Rooms	
Meeting rooms equipment	225 000	125 000	119 000	469 000
Technicians' cabins	116 000	148 000	197 000	461 000
Interpreters' cabins	11 000	13 000	16 000	40 000
TOTAL	352 000	286 000	332 000	970 000

1977 $110 000

(D) SOUND TRANSMISSION OF PROCEEDINGS.....1978 -

S.18. Provision will be made for audio-transmission of the proceedings of meetings held in the Boardroom and the two Agency meeting rooms in Building K. A central distribution point in Building K and a cross-network of about 25 listening points distributed throughout the various buildings are foreseen. Listening points will be installed in the delegates' lounges, the entrance hall of the Conference Building, and the Office Tower for selected senior officials.

Summary by item and cost

Item	Building		Total cost 1977
	Conference	Office	
Listening points	5 000	12 000	17 000
Central Unit	93 000	-	93 000
TOTAL	98 000	12 000	110 000

1977 $510 000

(E) CONFERENCE ROOM FURNITURE.....1978 $ 85 000

S.19. The estimate covers the cost of wired chairs, wired tables and normal chairs. They will be equipped with the necessary amplifiers, selector equipment and earphones to enable participants to follow the proceedings in the language of their choice. All conference furniture will be so designed as to be interchangeable with that of UNIDO. The requirements for chairs and tables have been established in relation to the seating capacity of the Boardroom, the two medium-sized rooms in the Conference Building and the three meeting rooms in the Office Towers. In the case of furniture that has to be wired, a significant period of time will be required to build in the selectors, microphones and other electronic units. Orders for such furniture will have to be placed in 1977 so that delivery may be effected in 1978. About 80% of this furniture will be used in the Conference Building and about 20% in the Office Tower.

Summary by item and cost

Item	Number	Unit cost	1977	1978	Total cost
Wired chairs	900	450	405 000	-	405 000
Wired tables	200	525	105 000	-	105 000
Normal chairs	400	212	-	85 000	85 000
TOTAL			510 000	85 000	595 000
Conference Building			408 000	68 000	476 000
Office Tower			102 000	17 000	119 000

1977 $55 000

(F) REGISTRY EQUIPMENT.....1978 $40 000

S.20. The archives of the Registry have to be equipped with compact shelving that has to be delivered in 1977. The estimated cost is $55 000. In addition, the messenger stations on each individual floor (conveyor terminals) and mail and pouch units have to be equipped. Twenty-one messenger stations are foreseen in the Office Tower, three in the Conference area and six in the Common Services Buildings. The mail and pouch units are in the Common Services area and the costs of equipping them will be shared with UNIDO. The total cost to the Agency of equipping the messenger stations and the mail and pouch units is estimated to be $40 000, all of which is foreseen for 1978.

1977 -

(G) BEVERAGE STATIONS AND SERVICE FACILITIES.....1978 $45 000

S.21. In the interest of economy and efficiency these stations are to be installed in the Office Tower, which is a significant distance from the Restaurant and Cafeteria located in the Common Services area. The triangular core in the middle of every second floor will be used for this purpose and, on the assumption that 120-130 people can be served from one of these stations, it is intended to install 11 of them. They will be equipped with dispensing units for cold and warm beverages (the units will be made available by the manufacturers) and a pantry unit including refrigerator, wash-up basin, cupboards and hot plates. A service kitchen is foreseen in the Director General's area, and a pantry is provided for each of the Departmental Heads.

(H)	SPECIAL VIDEO EQUIPMENT FOR CONFERENCE ROOMS	1977	$190 000
		1978	-

S.22. The configuration of the three meeting rooms in the Office Tower is such that normal methods of projection are not practicable. The walls are curved and the ceiling is rather low (2.60 m) which, coupled with the location of the interpreter booths and projection equipment, requires the use of a special system. The system consists of a fixed closed television system using 10 to 12 TV monitors in each room and TV cameras in the engineer's cabin. Transmission of sound and pictures, films, slides and paper copy in black and white and in colour is possible. For this purpose a multiplex unit is used with slide and film projectors. The equipment should be ordered in 1977. It is estimated to cost as follows:

Monitor system per room	55 000
Film and slide projector per room	8 000
Total per room	63 000
TOTAL (rounded off) for three rooms	190 000

(I)	PROJECTION EQUIPMENT	1977	$180 000
		1978	-

S.23. Three projection units are required in the Conference Building, namely, one unit consisting of a 35 mm, a 16 mm and an 8 mm film projector for the Boardroom, and one unit, consisting of a 16 mm and an 8 mm projector for each of the two medium-sized meeting rooms. Each of these units will also have slide projection equipment and projection screens.

(J)	PURCHASE AND SUPPLY STORAGE EQUIPMENT	1977	$15 000
		1978	$20 000

S.24. The Purchase and Supply Services Section will be located in the Common Services Building and the requirements have been worked out in conjunction with UNIDO. In order to store stationery supplies, 312 compact shelving units are needed. In addition, one battery-operated fork lift, one battery charging plant and one electric fork lift truck are required as warehouse equipment. Also provided are general purpose shelves and warehouse skids. The compact shelving should be ordered in 1977 and the balance of the equipment in 1978.

Compact shelving	15 000
Warehouse equipment	8 000
General purpose equipment	12 000
TOTAL	35 000

(K)	RESTAURANT AND KITCHEN EQUIPMENT	1977	$610 000
		1978	$155 000

S.25. The Restaurant and Kitchen are designed so that at a later date they may serve a total of 4500 persons in three sittings over the lunch period. The facility comprises a waiter-served restaurant, a self-service area, snack facilities, grills and a bar. The equipment to be purchased includes dish-washing facilities, a conveyor system for carrying dishes to these facilities, cool and deep-freeze areas, kitchen equipment, restaurant furnishings, and crockery and cutlery. The estimates are based on figures provided by a consulting

firm with expertise in this field. The Agency's share of the estimated cost, shown below, is based on one third of the total estimated cost.

Summary by item and cost

Item	1977	1978	Total cost
Preparation kitchen	84 000	8 000	92 000
Self-service kitchen	108 000	54 000	162 000
Restaurant	253 000	93 000	346 000
Coffee and pastry	68 000	-	68 000
Dish-washing	28 000	-	28 000
Pulp system and cooling rooms	69 000	-	69 000
TOTAL	610 000	155 000	765 000

(L)	WIRED INTERCOM, LOUDSPEAKER AND ALARM SYSTEM.....	1977	$135 000
		1978	-

S.26. The system is intended to provide for the following:

(a) A loudspeaker system for messages, alarm and paging;

(b) A two-way communication system in special areas, such as the Conference Service, the Kitchen, the Computer Service, the Medical Service and the Radiohydrology Testing Area;

(c) A two-way communication system between the entrances for the fire brigade and the central security office; and

(d) A chief/secretary intercommunication system.

S.27. The equipment requirements are as follows:

(a) For each of the Buildings A, E and K: one unit with microphones, amplifiers and loudspeakers. A central unit in Building E which can be used to override the individual systems when required, for instance, in case of an alarm;

(b) For each two-way communication system, sender/receiver apparatuses;

(c) A combined microphone and loudspeaker installation connected to the central security office; and

(d) Fifty chief/secretary type telephone handsets.

The estimated cost to the Agency is given below.

Summary by item and cost

Item	Conference Building	Office Building	Common Services Building	Total cost 1977
Loudspeaker system (300 items)	14 000	28 000	12 000	54 000
Intercommunication system	5 000	-	7 000	12 000
Squawkbox system (fire brigade - central security station)	-	-	1 000	1 000
Chief/secretary inter-communication system (50 systems)	-	68 000	-	68 000
TOTAL	19 000	96 000	20 000	135 000

	1977	$25 000
(M) SECURITY SURVEILLANCE SYSTEM.....	1978	$25 000

S.28. Under this item provision has been made for a surveillance system to ensure that entrances and special areas are kept shut and, also, for a walkie-talkie system of communication between the guards, the security checkpoints and the central security office. It is foreseen that the cost of these systems will be shared with UNIDO and the United Nations. The Agency's portion of the costs follows.

Summary by item and cost

Item	Conference Building	Office Building	Common Services Building	Total cost
Security surveillance system	7 000	6 000	12 000	25 000
Two-way communication walkie-talkie	-	-	25 000	25 000
TOTAL	7 000	6 000	37 000	50 000
1977	7 000	6 000	12 000	25 000
1978	-	-	25 000	25 000

	1977	$75 000
(N) DIRECTION AND OTHER SIGNS.....	1978	-

S.29. This item consists of name shields, room numbers, floor identification shields, direction signs, signs for the parkdecks and traffic signs. In a building of such size it is considered that the signs should be installed as soon as the structure is in a reasonable stage of readiness. Of the total number of signs to be used, about 50% will be for Building A-1 and 25% each for Buildings K and E. The Agency will be responsible for the total cost in the first building and will bear its share of costs in the other two areas.

	1977	$30 000
(O) ENGINEERING AND MAINTENANCE EQUIPMENT.....	1978	$55 000

S.30. This item comprises the Agency's share for engineering and building management equipment, including lockers for approximately 350 manual workers and cleaning staff estimated to cost $55 000. The Agency's share of a wireless paging (beep) system with approximately 120 receivers is estimated at $30 000.

	1977	$ 70 000
(P) COMMISSARY.....	1978	$100 000

S.31. The Commissary salesroom and storage area will have to be equipped with items such as deep-freeze and refrigerated food display equipment, shelving for both areas, a conveyor line, fork-lifts, cash registers and shopping carts. The cost of equipping the Commissary will be shared with UNIDO and the United Nations. Details of the estimated equipment costs to be borne by the Agency are given below.

Summary by item and cost

Major items	Cost 1977	Cost 1978	Total cost estimate
Deep-freezing and refrigeration equipment	-	25 000	25 000
Display equipment and shelves	-	44 000	44 000
Shopping equipment and cash registers	-	31 000	31 000
Machinery for cool and deep-freeze rooms	70 000	-	70 000
TOTAL	70 000	100 000	170 000

	1977	-
(Q) LOUNGES AND REFRESHMENT AREAS.....	1978	$65 000

S.32. In Building K, lounges for delegates will be installed on the three levels where conference rooms are situated. Each will comprise a service counter with the necessary equipment such as coffee machine, ice cubing machine, dish-washing unit, cash register, cupboards and the necessary cutlery, crockery and glassware. The Agency's share is based on 50% of the cost for such equipment on the Boardroom level (where UNIDO occupies the other half), and one quarter of such expenditure for Level 5 where the Agency has retained only two small conference rooms and UNIDO and the United Nations share the other.

	1977	-
(R) MEDICAL.....	1978	$110 000

S.33. The Joint Medical Servie has to be equipped with a view to providing the necessary facilities and services for the organizations to be housed at the International Centre. Certain equipment is required for the cubicles, the treatment rooms, the work and sterilization areas, the vaccination room, the physiotherapy section, the main examination room and the laboratories. Such equipment does not include the cost of furniture or typewriters since such requirements are provided for either in the special estimate for furniture or through the normal budget estimate to cover such costs.

S.34. The main expenditure has to be incurred for X-ray equipment and equipment for the intensive biochemical screening of staff, which was recommended by the last Annual Meeting of Medical Doctors of the United Nations. The main provisions are set out below.

General equipment	16 000
X-ray equipment	62 000
Special equipment (for a wide range of biochemical analyses: blood tests, cholesterol, sugar urine acid, etc.)	32 000
TOTAL	110 000

ANNEX I

CONFERENCES, SYMPOSIA AND SEMINARS IN 1977

Within the limits of the appropriations and subject to the requirements of the individual programmes as outlined for 1977, 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

Food and agriculture

1.	Symposium on the use of induced mutations for improving disease resistance of crop plants	D. 49
2.	Symposium on food irradiation	D. 118
3.	Regional seminar on improvement of rice production through research using nuclear techniques	D 49

Life sciences

4.	Symposium on radioimmunoassay and related procedures in medicine	E. 23
5.	Symposium on national and international standardization of radiation dosimetry	E. 53
6.	Interregional seminar on basic methods and techniques in radiobiological and environmental health research	E. 90

Physical sciences

7.	Symposium on neutron inelastic scattering	F. 28
8.	Symposium on mineral resources: nuclear techniques in exploration, extraction and processing	F. 45
9.	Regional seminar on utilization of research nuclear centres	F. 54
10.	Seminar on the development of nuclear theory and computer codes	F. 99

International Centre for Theoretical Physics

11.	Workshop in solid state physics	H. 11
12.	Topical meetings in high energy and particle physics	H. 15
13.	Workshop in nuclear physics	H. 19
14.	Workshop in plasma physics	H. 23
15.	Winter college on atomic physics	H. 27
16.	Topical meeting and research sessions in astrophysics and relativity	H. 31
17.	Course in geophysics or systems analysis	H. 36
18.	Course on the teaching of physics	H. 37

Nuclear power and reactors

19.	Seminar on uranium evaluation and mining methods	I. 37
20.	Symposium on the application of reliability technology to nuclear power plants	I. 119
21.	International conference on nuclear power and its fuel cycle	I. 20

Nuclear safety and environmental protection

22.	Symposium on monitoring of radioactive airborne and liquid releases from nuclear facilities	J. 41
23.	Seminar on the application of environmental impact analysis to the nuclear power industry	J. 106
24.	Symposium on the handling of radiation accidents	J. 33

Information and technical services

25.	Seminar on the International Nuclear Information System	L. 25

Safeguards

26.	Safeguards training seminar	N. 48

ANNEX II

TECHNICAL COMMITTEES AND ADVISORY GROUPS IN 1977

Within the limits of the appropriations and subject to the requirements of the individual programmes as outlined for 1977, it is planned to hold the meetings listed below. The reference following each meeting is to the relevant paragraph in the programme.

Executive management and technical programme planning

1.	Scientific Advisory Committee	B. 3

Food and agriculture

2.	Advisory group on fertilizer management practices of specific tree crops	D. 21
3.	Advisory group on the use of isotopic techniques in ticks and tick-borne diseases	D. 70
4.	Advisory group on the use of radiation-induced mutations for insect and pathogen resistance of crop plants	(D. 75 (D. 90
5.	Advisory group on irradiation of animal feed	D. 118

Life sciences

6.	Technical committee on use of radioisotopes in haematology (with International Committee on Standardization in Haematology)	E. 29
7.	Technical committee on technical aspects of in-pile chemical dosimetry intercomparison	E. 59
8.	Advisory group on clinical applications of modifiers of radiosensitivity	E. 79
9.	Technical committee on radiation sensitivity of pathogenic organisms in sewage	E. 84
10.	Advisory group on radiobiological equivalents of chemical pollutants	E. 90
11.	Advisory group on radionuclide kits for in vitro assays	E. 23

Physical sciences

12.	Advisory group on applied nuclear physics	F. 23
13.	Advisory group on injectors for fusion reactors	F. 34
14.	Technical committee: International Fusion Research Council	F. 34
15.	Advisory group on isotope production technology	F. 54

38.	Specialists' meeting on fusion reactor technology	I. 149
39.	Specialists' meeting on high-intensity neutron sources	I. 149
40.	Specialists' meeting on Monte Carlo methods	I. 154
41.	Technical committee on reactor radiation measurements (IWG)	I. 156
42.	Specialists' meeting on radiation damage units	I. 156
43.	Technical committee: MHD liaison group	I. 161

Nuclear safety and environmental protection

44.	Advisory group on revision of the basic safety standards for radiation protection (SS. No. 9 - w/WHO, ILO, NEA)	J. 22
45.	Advisory group on revision of the basic requirements for personnel monitoring (SS. No. 14 - w/WHO)	J. 22
46.	Advisory group on radiological safety aspects of the use of plutonium as nuclear fuel (fabrication, use, transport, storage)	J. 33
47.	Advisory group on questions of mutual co-operation between countries in the Danube catchment area (continuation)	J. 42
48.	Advisory group on procedures to be followed in the event of accidental release of radioactive materials during transport (w/Legal Division)	J. 43
49.	Advisory group on emergency planning for nuclear facilities (second meeting)	(J. 33 (J. 43
50.	Advisory group on public acceptance of nuclear programmes (Joint IAEA/IIASA Project)	J. 51
51.	Advisory group on design, maintenance and testing of ventilation and air filtering systems	J. 57
52.	Advisory group on characteristics of solidified high-level radioactive waste products for storage or disposal	J. 87
53.	Advisory group for waste management at nuclear power stations (continuation)	J. 88
54.	Advisory group on the safe storage, handling and on-site transportation of irradiated fuel and components at reactor plants (continuation)	J. 88
55.	Advisory group on the Agency's responsibilities under the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (continuation)	J. 108

56.	Advisory group on procedures for establishing limits for the release of radioactive material into the environment (continuation)	(J. 41 (J.109
57.	Technical committee on decommissioning of nuclear facilities (continuation)	J.119
58.	Advisory group on safety research and development (I)	J.143
59.	Advisory group on safety research and development (II)	J.143
60-75.	Sixteen technical review committees	J.132
76-80.	Five senior advisory groups	J.132

Information and technical services

81.	Technical committee: Annual consultative meeting of INIS liaison officers	L. 25
82.	Technical committee on INIS Thesaurus	L. 25

Nuclear explosions for peaceful purposes

83.	Advisory group on legal and treaty aspects of PNEs	M. 9
84.	Advisory group to develop procedures for the Agency to use in later stages of PNE projects	M. 10

Safeguards

85.	Advisory group on categorization of nuclear material for accountancy, control and safeguards	N. 37
86.	Advisory group on States' systems of accounting for and control of nuclear material, or physical protection of nuclear material and radioactive material	N. 48
87.	Advisory group on safeguards procedures for isotopic enrichment facilities	N. 43
88.	Advisory group on development of portable NDA instrumentation and techniques for safeguards	N. 40
89.	Advisory group on accuracy of nuclear material accountancy	N. 37
90.	Standing advisory group on safeguards implementation	N. 15

Administration

91.	Advisory group on international acceptance of irradiated food	(D.124 (O. 27

ANNEX III

CONFERENCES AND SYMPOSIA IN 1978

As mentioned in paragraph 3 of the Introduction to the present document, a list of scientific meetings considered by the Scientific Advisory Committee is presented for the second year of the biennium 1977-78. The reference following each meeting is to the relevant paragraph in the programme.

Food and agriculture

1.	Symposium on protein improvement in cereals and grain legumes	D. 43
2.	Symposium on isotopes and radiation in research on soil plant and water relationships	D. 15

Life sciences

3.	Symposium on the late biological effects of ionizing radiation	E. 79
4.	Symposium on nuclear activation techniques in life sciences	E. 36

Physical sciences

5.	Conference on plasma physics and controlled nuclear fusion research	F. 34
6.	Symposium on isotope techniques in surface water hydrology	F. 74

Nuclear power and reactors

7.	Symposium on fuel element cladding materials including zirconium	I. 59
8.	Symposium on control and instrumentation of nuclear power plants	I. 119
9.	Symposium on design, construction and operating experience with demonstration liquid metal fast breeder reactors	I. 141

Nuclear safety and environmental protection

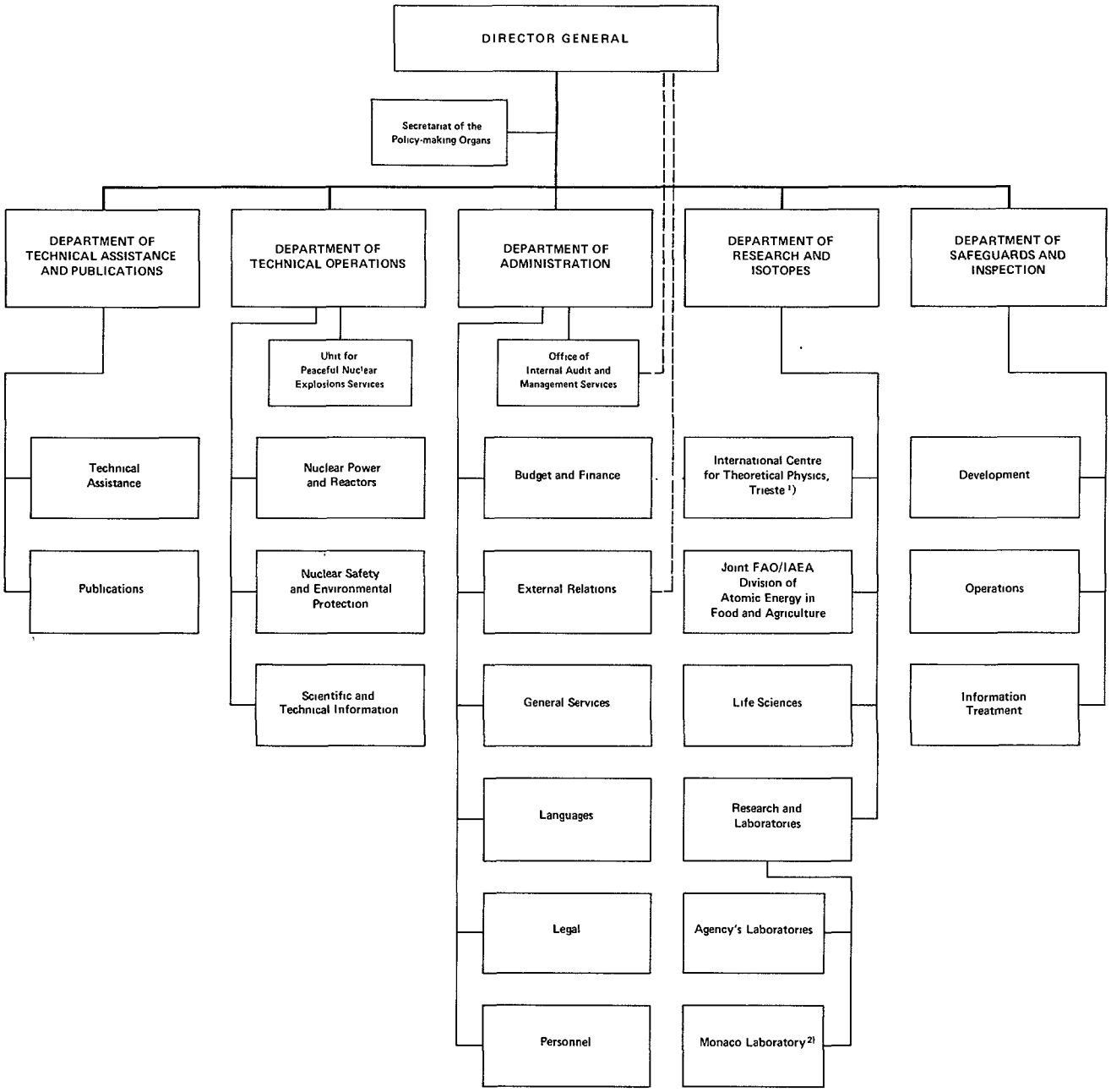
10.	Symposium on advances in radiation protection monitoring	J. 34
11.	Symposium on the behaviour of tritium in the environment	J. 107
12.	Symposium on the decommissioning of nuclear facilities	J. 119
13.	Symposium on the problems associated with the export of nuclear power reactors (in co-operation with Nuclear power and reactors)	(I 101 (J. 139

Safeguards

14.	International symposium on the safeguarding of nuclear material	N. 50

ANNEX IV

ORGANIZATIONAL CHART



1) Jointly operated by the Agency and UNESCO
2) With the increasing participation of UNESCO and UNEP

ANNEX V

THE MANNING TABLE

Changes in 1976

Table 1

	DG	DDG or IG	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)	-	(2)
Department of Administration	-	-	-	-	-	-	-	-	-	-	-	-
Division of Budget and Finance	-	-	-	-	-	-	-	-	-	1	-	1
Division of General Services	-	-	-	-	1	(1)	-	-	-	-	-	-
Division of External Relations	-	-	-	(1)	1	-	-	1	1	-	-	1
Division of Languages and Policy-making Organs	-	-	1	-	(1)	1	-	-	1	-	-	1
Legal Division	-	-	-	1	(1)	-	-	-	-	-	-	-
Division of Personnel	-	-	-	-	-	-	-	(1)	(1)	-	-	(1)
Department of Research and Isotopes	-	-	-	-	-	-	-	-	-	-	-	-
Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture	-	-	-	1	(1)	-	-	-	-	-	-	-
Division of Life Sciences	-	-	-	-	1	-	-	-	1	-	-	1
The Agency's Laboratory	-	-	-	(1)	-	-	-	-	(1)	-	-	(1)
Department of Safeguards and Inspection	-	-	-	-	-	-	-	-	-	1	-	1
Unit for Safeguards Information Treatment	-	-	-	1	4	2	-	-	7	4	-	11
Division of Development	-	-	-	1	(2)	-	(1)	-	(2)	(1)	-	(3)
Division of Operations	-	-	-	(2)	(2)	(2)	1	-	(5)	(4)	-	(9)
Department of Technical Assistance and Publications	-	-	-	-	-	1	(1)	-	-	-	-	-
Division of Technical Assistance	-	-	-	-	1	(1)	1	-	1	-	-	1
Division of Publications	-	-	-	-	(1)	-	-	-	(1)	-	-	(1)
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-

1976 Adjusted

Table 2

	DG	DDG or IG	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	4	2	-	6
Department of Administration	-	1	-	1	-	-	1	-	3	2	-	5
Office of Internal Audit and Management	-	-	1	-	1	2	1	-	5	4	-	9
Division of Budget and Finance	-	-	1	3	3	2	3	4	16	32	-	48
Division of General Services	-	-	1	1	3	3	1	-	9	70	116	195
Division of External Relations	-	-	2	5	3	3	3	1	17	21	-	38
Division of Languages and Policy-making Organs	-	-	2	6	18	25	1	-	52	41	1	94
Legal Division	-	-	1	3	2	1	1	-	8	5	-	13
Division of Personnel	-	-	1	2	3	3	-	-	9	25	-	34
Department of Research and Isotopes	-	1	-	1	-	-	1	-	3	2	-	5
Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture	-	-	-	7	5	1	-	-	13	8	-	21
Division of Life Sciences	-	-	1	5	7	1	1	-	15	10	-	25
Division of Research and Laboratories	-	-	1	5	10	5	2	1	24	16	-	40
The Agency's Laboratory	-	-	-	4	14	5	5	2	30	59	24	113
The Monaco Laboratory	-	-	-	2	3	1	-	3	9	13	-	22
International Centre for Theoretical Physics	-	-	-	1	1	3	-	-	5	17	-	22
Department of Safeguards and Inspection	-	1	-	1	2	1	-	-	5	7	-	12
Unit for Safeguards Information Treatment	-	-	-	1	4	2	-	-	7	4	-	11
Division of Development	-	-	1	8	9	2	-	-	20	8	-	28
Division of Operations	-	-	2	14	21	28	5	-	70	17	-	87
Department of Technical Assistance and Publications	-	1	-	-	1	2	-	-	4	7	-	11
Division of Technical Assistance	-	-	1	7	10	1	3	-	22	30	-	52
Division of Publications	-	-	1	1	-	5	4	4	15	101	14	130
Department of Technical Operations	-	1	-	-	-	1	-	1	3	2	-	5
Unit for Peaceful Nuclear Explosions Services	-	-	-	1	-	-	-	-	1	1	-	2
Division of Nuclear Safety and Environmental Protection	-	-	1	16	11	4	-	-	32	24	-	56
Division of Nuclear Power and Reactors	-	-	1	11	12	3	2	-	29	14	-	43
Division of Scientific and Technical Information	-	-	1	3	10	8	6	5	33	72	-	105
TOTAL	1	5	20	109	153	112	41	22	463	614	155	1 232

Changes for 1977

Table 3

	DG	DDG or IG	D	P-5	P-4	P-3	P-2	P-1	Sub-total	GS	M&O	Total
Office of the Director General	-	-	-	-	-	1	-	(1)	-	-	-	-
Secretariat of the Policy-making Organs	-	-	1	-	2	-	-	-	3	3	-	6
Department of Administration												
Division of Budget and Finance	-	-	-	-	1	-	1	(1)	1	4	-	5
Division of General Services	-	-	-	1	(1)	-	-	-	-	1	13	14
Division of External Relations	-	-	-	-	-	-	1	(1)	-	1	-	1
Division of Languages and Policy-making Organs[a/]	-	-	(1)	-	(2)	-	-	-	(3)	(3)	-	(6)
Division of Personnel	-	-	-	-	-	-	-	-	-	2	-	2
Department of Research and Isotopes												
Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture	-	-	-	-	1	-	-	-	1	-	-	1
Division of Research and Laboratories	-	-	-	1	-	-	-	-	1	1	-	2
The Agency's Laboratory	-	-	-	1	(1)	-	-	-	-	1	-	1
The Monaco Laboratory	-	-	-	-	-	-	-	(1)	(1)	2	-	1
Department of Safeguards and Inspection												
Unit for Safeguards Information Treatment	-	-	1	2	1	1	-	-	5	10	-	15
Division of Operations	-	-	-	2	4	-	(2)	-	4	4	-	8
Department of Technical Assistance and Publications												
Division of Technical Assistance	-	-	-	-	-	1	-	-	1	1	-	2
Division of Publications	-	-	-	-	-	1	3	(4)	-	1	-	1
Department of Technical Operations												
Unit for Peaceful Nuclear Explosions Services	-	-	-	-	1	-	-	-	1	-	-	1
Division of Nuclear Safety and Environmental Protection	-	-	-	-	3	(1)	-	-	2	1	-	3
Division of Nuclear Power and Reactors	-	-	-	-	2	1	-	-	3	2	-	5
Division of Scientific and Technical Information	-	-	-	-	1	-	(1)	-	-	3	-	3
TOTAL	-	-	1	7	12	4	2	(8)	18	34	13	65

a/ From 1977 onward Division of Languages.

1977

Table 4

	DG	DDG or IG	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	-	4	2	-	6
Secretariat of the Policy-making Organs	-	-	1	-	2	-	-	-	3	3	-	6
Department of Administration	-	1	-	1	-	-	1	-	3	2	-	5
Office of Internal Audit and Management	-	-	1	-	1	2	1	-	5	4	-	9
Division of Budget and Finance	-	-	1	3	4	2	4	3	17	36	-	53
Division of General Services	-	-	1	2	2	3	1	-	9	71	129	209
Division of External Relations	-	-	2[a/]	5	3	3	4	-	17	22	-	39
Division of Languages	-	-	1	6	16	25	1	-	49	38	1	88
Legal Division	-	-	1	3	2	1	1	-	8	5	-	13
Division of Personnel	-	-	1	2	3	3	-	-	9	27	-	36
Department of Research and Isotopes	-	1	-	1	-	-	1	-	3	2	-	5
Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture	-	-	-	7	6	1	-	-	14	8	-	22
Division of Life Sciences	-	-	1	5	7	1	1	-	15	10	-	25
Division of Research and Laboratories	-	-	1	6	10	5	2	1	25	17	-	42
The Agency's Laboratory	-	-	-	5	13	5	5	2	30	60	24	114
The Monaco Laboratory	-	-	-	2	3	1	-	2	8	15	-	23
International Centre for Theoretical Physics	-	-	-	1	1	3	-	-	5	17	-	22
Department of Safeguards and Inspection	-	1	-	1	2	1	-	-	5	7	-	12
Division of Development	-	-	1	8	9	2	-	-	20	8	-	28
Division of Operations	-	-	2	16	25	28	3	-	74	21	-	95
Division of Safeguards Information Treatment	-	-	1	3	5	3	-	-	12	14	-	26
Department of Technical Assistance and Publications	-	1	-	-	1	2	-	-	4	7	-	11
Division of Technical Assistance	-	-	1	7	10	2	3	-	23	31	-	54
Division of Publications	-	-	1	1	-	6	7	-	15	102	14	131
Department of Technical Operations	-	1	-	-	-	1	-	1	3	2	-	5
Unit for Peaceful Nuclear Explosions Services	-	-	-	1	1	-	-	-	2	1	-	3
Division of Nuclear Safety and Environmental Protection	-	-	1	16	14	3	-	-	34	25	-	59
Division of Nuclear Power and Reactors	-	-	1	11	14	4	2	-	32	16	-	48
Division of Scientific and Technical Information	-	-	1	3	11	8	5	5	33	75	-	108
TOTAL	1	5	21	116	165	116	43	14	481	648	168	1 297

a/ The present Head of the Division has the rank of Assistant Director General.

1978

Table 5

	DG	DDG or IG	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	-	4	2	-	6
Secretariat of the Policy-making Organs	-	-	1	-	2	-	-	-	3	3	-	6
Department of Administration	-	1	-	1	-	-	1	-	3	2	-	5
Office of Internal Audit and Management	-	-	1	-	1	2	1	-	5	4	-	9
Division of Budget and Finance	-	-	1	3	4	2	5	3	18	38	-	56
Division of General Services	-	-	1	2	2	3	1	-	9	71	129	209
Division of External Relations	-	-	2	5	3	3	4	-	17	22	-	39
Division of Languages	-	-	1	6	16	25	1	-	49	38	1	88
Legal Division	-	-	1	3	2	1	1	-	8	5	-	13
Division of Personnel	-	-	1	2	3	3	-	-	9	28	-	37
Department of Research and Isotopes	-	1	-	1	-	-	1	-	3	2	-	5
Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture	-	-	-	7	7	1	-	-	15	9	-	24
Division of Life Sciences	-	-	1	5	8	1	1	-	16	10	-	26
Division of Research and Laboratories	-	-	1	6	10	5	2	1	25	17	-	42
The Agency's Laboratory	-	-	-	5	13	7	3	2	30	60	27	117
The Monaco Laboratory	-	-	-	2	3	1	-	2	8	15	-	23
International Centre for Theoretical Physics	-	-	-	1	1	3	-	-	5	17	-	22
Department of Safeguards and Inspection	-	1	-	1	2	1	-	-	5	7	-	12
Division of Development	-	-	1	8	9	2	-	-	20	8	-	28
Division of Operations	-	-	2	18	32	30	3	-	85	28	-	113
Division of Safeguards Information Treatment	-	-	1	3	5	3	-	-	12	14	-	26
Department of Technical Assistance and Publications	-	1	-	-	1	2	-	-	4	7	-	11
Division of Technical Assistance	-	-	1	8	10	2	3	-	24	32	-	56
Division of Publications	-	-	1	1	-	8	6	-	16	101	14	131
Department of Technical Operations	-	1	-	-	-	1	-	1	3	2	-	5
Unit for Peaceful Nuclear Explosions Services	-	-	-	1	1	-	-	-	2	1	-	3
Division of Nuclear Safety and Environmental Protection	-	-	1	16	14	3	-	-	34	25	-	59
Division of Nuclear Power and Reactors	-	-	1	11	14	4	2	-	32	16	-	48
Division of Scientific and Technical Information	-	-	1	4	11	10	6	2	34	77	-	111
TOTAL	1	5	21	120	174	124	42	11	498	661	171	1 330

ANNEX VI

IAEA/UNEP COLLABORATION - STATUS ON 1 JULY 1976

Number assigned by UNEP	Title of project	UNEP contribution proposed by the Agency				UNEP allocation received by the Agency			
		1975	1976	1977	1978	1975	1976	1977	1978
FP/0501-75-03 (542)	Evaluation of releases of radionuclides into aquatic environments (Nuclear safety and environmental protection [NSEP])	10 000		12 000		5 750		13 000	
0102-74-001	Studies of the radiation doses to the population from the peaceful use of atomic energy, including nuclear industry (NSEP)			29 000	63 000				
Proposal 297	Studies on the development of environmental surveillance programmes related to the release of radioactive and other contaminants (NSEP)	70 500	95 000	155 000					
0102-74-002	Studies of the measures to be taken in international co-operation in the long-term management of high-level and alpha-bearing radioactive wastes (NSEP)	43 700	65 700			43 700	65 700		
Proposal 298	Study of the feasibility of developing a register of releases of significant quantities of radioactive materials to the biosphere (NSEP)	36 250	84 750	48 250					
	Biogeochemical studies of selected pollutants: Open ocean measurements and laboratory experiments (Monaco)		111 000	68 000					
FP/0503-75-04 (979)	The Mediterranean programme activity: Intercalibration measurements for pilot projects under the co-ordinated pollution monitoring and research programme - Med IV (Monaco)		22 500	22 500			22 000	22 000	
0700-75-01	Regional Centres for Nuclear Fuel Cycle (Nuclear Power and Reactors)	19 750	54 450	8 000			35 000	38 200	
	Activation analysis of human hair		125 000	140 000	142 000				
	Multi-Agency Mediterranean Programme Activity; Pollutants from land-based sources in the Mediterranean Med X								
	PHASE I (Preparatory)		1 000						
	PHASE II		4 000				4 000		
	TOTAL	180 200	563 400	482 750	205 000	49 450	126 700	73 200	

ANNEX VII

Draft resolutions

A. REGULAR BUDGET APPROPRIATIONS FOR 1977

The General Conference,

Accepting the recommendations of the Board of Governors relating to the Regular Budget of the Agency for 1977 [1],

1. Appropriates an amount of $43 501 000 for the Regular Budget expenses of the Agency in 1977, as follows:

Section		United States dollars
1.	Policy-making organs	1 614 000
2.	Executive management and administration [2]	5 784 000
3.	General services	4 177 000
4.	Technical assistance and training	1 867 000
5.	Research and isotopes [3]	8 069 000
6.	Operational facilities [4]	1 210 000
7.	Technical operations [5]	9 479 000
8.	Safeguards	7 951 000
9.	Transfer of the Agency to its Permanent Headquarters	3 350 000
	TOTAL	43 501 000

2. Decides that the funds appropriated for Section 1 through 8 in paragraph 1 above shall be financed as follows:

(a) $3 151 000 from miscellaneous income; and

(b) $37 000 000 from contributions by Member States on the basis of the scale of assessment fixed by the General Conference in Resolution GC(XX)/RES/. . . .;

3. Decides further that the appropriation of $3 350 000 for Section 9 in paragraph 1 above shall be made up as follows:

(a) $220 863 from the final cash surplus in respect of 1974; [6]

(b) $2 007 283 from the cash surplus in respect of 1975; [7]

(c) $ 1 000 000 from the cash surplus in respect of 1976; and

(d) Such further amounts as may become available under sub-paragraphs (b) and (c) above as, together with the sum provided for in sub-paragraph (a), do not produce a total of more than $3 350 000;

4. Authorizes the Director General:

(a) To incur expenditures additional to those for which provision is made in the Regular Budget for 1977, 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 and Operational Budgets for 1977; 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(XX)/567, Table 2.

[2] For the financing of Executive management and technical programme planning, Administration and the undistributed balance of Service activities.

[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 Nuclear power and reactors, Nuclear safety and environmental protection, Information and technical services and Nuclear explosions for peaceful purposes.

[6] See document GC(XX)/566, Part IV, Statement I.D.

[7] Ibid., Part IV, Statement I.C.

B. OPERATIONAL BUDGET ALLOCATIONS FOR 1977

The General Conference,

(a) Accepting the recommendations of the Board of Governors relating to the Agency's operational programme for 1977 [1], and

(b) Noting that funds from various sources, estimated at $1 505 000 are expected to be available for that programme,

1. Decides that for 1977 the target for voluntary contributions to the General Fund shall be $6 000 000;

2. Urges all Member States to make voluntary contributions to the General Fund for 1977 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, so that this target may be reached;

3. Allocates the following sums for the Agency's operational programme for 1977:

	United States dollars
Operating Fund I	1 155 000
Operating Fund II	6 350 000
	7 505 000

4. Authorizes the Director General to incur expenditures for the International Laboratory of Marine Radioactivity or for the International Centre for Theoretical Physics in addition to those for which provision is made in the Operational Budget for 1977, provided that the relevant emoluments of any staff involved and all other costs are entirely financed from revenues arising out of work performed for Member States or international organizations, research grants, special contributions or other sources extraneous to the Regular and Operational Budgets for 1977.

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[1] See document GC(XX)/567, Table 3.

C. THE WORKING CAPITAL FUND IN 1977

The General Conference,

Accepting the recommendations of the Board of Governors relating to the Agency's Working Capital Fund in 1977 [1],

1. Approves a level of $2 million for the Agency's Working Capital Fund in 1977;

2. Decides that the Fund shall be financed, administered and used in 1977 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(XX)/567, para. 30.

[2] INFCIRC/8/Rev.1 and Mod.1.