EUROPEAN ATOMIC ENERGY COMMUNITY
EURATOM

THE COMMISSION

Fifth

GENERAL REPORT

on the

Activities of the Community

(April 1961 - March 1962)

APRIL 12, 1962

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INTRODUCTION

I. If Europe wishes to maintain its rightful position in the vanguard of scientific and technical progress, it must follow through with the efforts which it has been making to smooth the way for its imminent breakthrough into the industrial stage of the nuclear era. The doubling of power consumption within the Community over a period of 20 years, coupled with a foreseeable quadrupling of the electricity demand, underlines the significance of the tasks invested in Euratom by the Treaty: to foster the development of the conditions necessary for the rapid establishment and expansion of nuclear industries, the training of the personnel which the new technology will inevitably require, the raising of living standards in the Member States and the widening of exchanges with the non-Community countries.

Activities undertaken in all these fields have been stepped up during the period under review. Euratom's transition to the plane of concrete achievement, signalised by the Commission in the 4th General Report, heralded the beginning of a trend which has become increasingly marked over the past year. The branch establishments of the Community's Joint Nuclear Research Centre and the many links forged by the work of the Commission have brought home to the general public, through these positive achievements, that the European Atomic Energy Community is not only very much of a "going concern" but also an institution in which the robustness of the European concept finds unmistakable expression.

These activities, which are carried out in close cooperation with the Member States, thus ensuring a tightly-knit and well-balanced overall pattern for the individual programmes pursued by these countries, constitute one of the essential factors in Euratom's success, evidenced as it is by the decision of the United Kingdom and Denmark to apply for Community membership.

It is thus the Commission's task to take a comprehensive view of the various national schemes and to make due allowance for them in the planning and implementation of its own research and training programme, which represents one of the cornerstones in the policy of promoting the conditions necessary to the development of the nuclear industries. In 1959, having noted the results of the permanent routine survey of the research undertaken in the Member States, and after consultation with the Scientific and Technical Committee, the Commission established the broad lines to be pursued in its first five-year research programme, to wit:

— power applications of nuclear techniques and allied research,

— controlled thermonuclear reactions,

— applications of radioisotopes and radiations.

It was on the basis of these directives, which appear to be more pertinent than ever in the present situation, that the first research programme was conducted, both in the branch establishments of the Joint Research Centre and under contracts awarded to various firms and bodies. Following the completion of its first programme, which has done so much, from the standpoint of technical progress, to strengthen the links between the member countries, Euratom has prepared its second programme spelling out the policy to be followed in the years 1963 to 1967.

II. Noteworthy advances have been made by the Joint Research Centre at Ispra. The neutron physics, metallurgy, chemistry, heat-transfer and technology sections have given priority to the study of the numerous problems posed by the development of heavy-water-moderated organic-liquid-cooled reactors (ORGEL Project). The Commission hopes that these studies will enable it to test out, in the very near future, a type of power reactor suited to European operating conditions. A critical experiment is now in the process of construction.

Following the installation of electronic computer equipment, the Scientific Data Processing Centre (CETIS) has been able,

since last September, to meet the Joint Centre's requirements in the matter of calculations, to satisfy a growing number of outside orders and to make further progress with its work on automatic documentation and translation.

At the same time, other groups have been set up at Ispra for studies connected with nuclear physics, the direct conversion of nuclear energy into electricity, the processing of radio-active effluents and mineralogy and geochemistry.

These activities have been rounded off by work carried out under a large number of research and association contracts.

III. The signing in July 1961 of an agreement between the Dutch Government and Euratom on the setting up at Petten of a second Joint Research Centre general-purpose establishment has made it possible to proceed with the detailed elaboration of the programme.

Although the programme will be centred on the high-flux reactor (HFR), the Commission intends to give the establishment a wider field of action by entrusting it, for instance, with additional tasks in the sphere of materials and technology, with particular reference to active circuits, graphite and thorium.

IV. The third Joint Centre establishment, the European Transuranium Institute, at Karlsruhe, is to have a specific assignment. By the terms of the programme drawn up in 1961, it will undertake, besides special activity in the field of plutonium—and notably the development, on a pilot or laboratory scale, of plutonium-based fuel elements—research into transplutonium elements. The Institute will have a particularly important role by reason of the fact that whereas the Community at present depends on external sources for its supplies of enriched uranium, plutonium appears likely to oust enriched uranium as a thermal reactor fuel to a progressively greater extent.

V. Finally, under a Convention signed with the Belgian Government in June 1961, the Central Nuclear Measurements Bureau (CNMB) has been able to be officially constituted, after having operated for nearly two years in a provisional form.

The CNMB is gradually being fitted out. With the installation of the initial equipment, the expansion of the staff and the ordering of two accelerators, the Bureau, apart from carrying out the work scheduled in the Community's programme, has, like CETIS, been able to fulfil more and more outside orders.

VI. Such, briefly, is the sum of Euratom's activity as far as the programme for its own establishments is concerned. Another, also very important, aspect of its activity consists in contracts placed with firms and bodies in the Community, contracts of association and international agreements. The Commission is taking care to strike a judicious balance between its own research projects and those performed under contract.

As regards international agreements, some of these are of a general character: an instance of this is provided by the US/Euratom joint programme, a scheme of cooperation which has already proved fruitful for both parties. Thus the materials research embarked upon under the US/Euratom Agreement has resulted in the conclusion of 34 new contracts in Europe. Other agreements relate to specific research and development projects, cases in point being the two agreements with the OECD on the advanced gas-cooled reactor being studied under the DRAGON Project and the heavy boiling-water reactor project at Halden (Norway).

The activities directly undertaken by Euratom are supplemented by research contracts, some of which are of the association type. The research involved has either a specific aim or else is comprehensive in scope, such as the ORGEL Project or controlled thermonuclear fusion.

While work provided for under research and association contracts placed in 1959 and 1960 has continued, 124 new contracts valued at 47 million EMA units of account were concluded last year, the most important being in the fields of fusion, low-energy nuclear physics and biology. This brought the total number of contracts as at 1 April 1962 to 240.

The high-flux materials testing reactor BR 2, in the operation of which the Commission has been participating under contract since 1960, has gone critical and the first experiments have

started. Together with the HFR reactor at Petten, it will in the near future provide Euratom with large-scale irradiation facilities to meet its own needs and those of the Community.

In the basic field of fast reactors, important contracts of association are shortly to be signed. They will serve to amplify the work originally initiated at national level.

The scale of this activity bears witness to the importance attached by the Commission to creating and consolidating a large-scale and independent nuclear capacity.

VII. In keeping with the spirit of the Treaty, all Euratom's activities, and in particular those relating to research and the training of specialised personnel, are designed first and foremost to promote the nuclear industries.

This indirect effort is underpinned by more immediate assistance in the form of contracts and orders, by means of which the Community will be enabled to widen the fairly restricted market at present available to these infant industries and consequently make it possible for them to advance more rapidly to the stage of paying production.

VIII. The Commission has continued to study the probable trends in the construction of nuclear power plants.

In 1961, the Community's nuclear electricity output amounted to 200 million kWh, as compared with no more than 4 million kWh for 1958. The experts forecast that by the end of 1966 the annual rate of production will have attained 8,000 to 10,000 million kWh. Commissioned nuclear power in 1966 is likely to be of the order of 1,600 MWe, against 73 MWe, at December 1961.

The Community is backing this expansion as a means of preparing the nuclear industries for the tasks awaiting them. It has sponsored the creation of full-scale power plants and gained the Council's approval for a programme of Community participation in power reactor construction. This programme is now being carried out, and three power plants totalling between 500 and 600 MWe have been incorporated in it to date. In

return, the Community will be able to assign technicians to assist in the building of the reactors and will be kept abreast of the technical progress accomplished.

IX. The construction of power reactors cannot but lend added urgency to the task of finding a solution to the problem of coverage for risks resulting from nuclear operations.

The preparatory work on the Supplementary Convention to the Paris Convention of 29 July 1960 is on the point of completion, and several non-member states have expressed their desire to adhere to it.

X. In the field of nuclear-powered merchant vessels, the Commission has continued to lend its support to the measures taken in the various member countries. It is participating, through four contracts of association, in theoretical and experimental studies as well as in the drafting of construction plans relating to specific projects. It has set up a Liaison Committee to facilitate the coordination of work under these four contracts.

XI. The Information Bureau on Radioisotopes came into effective operation in November 1961. It will be assisted by a Consultative Committee composed of representatives of producers and users and by a number of specialised sub-committees. Furthermore, a publicity campaign has been planned.

In order to stimulate the improvement of techniques already tested out and the development of new applications or processes, the Commission has concluded contracts with various Community enterprises in connection with practical problems bound up with radioisotope applications.

* * *

XII. In April 1962, Euratom finds itself at the end of an initial phase, marked by its *first five-year programme,* and is preparing to embark upon a second phase the salient features of which are beginning to take shape.

At the present stage of the first five-year programme, it is seen that on its completion the Commission will have appropriated nearly the whole of the 215 million EMA units of account provided for in Annex V to the Treaty, allowing for the 20 million units of account credit still to be opened under this programme.

The fact is that the first two years (1958 and 1959) were devoted mainly to preparatory operations requiring fairly limited financial commitments. It is therefore during the period 1960-1962 that the bulk of the 215 million has been immobilised, to which must be added the greater part of the contributions (totalling about 30 million EMA units of account) made by the Member States to the setting up of the branch establishments of the Joint Centre in their respective territories.

All this is reflected in the annual research budgets, the volume of which is clearly on the increase: budgetary commitments, which in 1958 were 0.45 million u.a., amounted to 2.76 million in 1959, to 30.58 million in 1960 and to 70.65 million in 1961.

Taking into account 17.19 million EMA u.a. of fixed appropriations outstanding at the end of the financial year 1961 and fixed appropriations of 71.44 million in the 1962 budget, the Commission will have made use of 193.07 million EMA u.a. since 1958.

The total manpower, which at 31 March 1961 amounted to 1610, had by 31 March 1962 risen to 1977.

XIII. In continuing the basic activities scheduled in the first programme, the *second programme* will have a substantial margin for new operations to allow for the possible discovery of new techniques. A satisfactory balance will be maintained between operations designed to facilitate the achievement of more immediate aims and those destined to prepare the reactor-strings of the future.

The scale and guiding principles of the second five-year programme will be the main factors in determining the measure

of success and efficiency with which Euratom will be able to fulfil the tasks confronting it.

While the most important part of the programme concerns reactor development, other activities are also scheduled, notably isotope research, biological research and health and safety problems. In addition, some basic research will be conducted in fields bound up with the development of the various techniques. Greater attention will be devoted to the dissemination of information as well as to the training of specialists.

In mapping out operations, account has invariably been taken of the programmes in progress in the member countries, which are supplemented and interlinked by the Commission's programme. More particularly, this policy finds concrete expression in the work of the Consultative Committee on Nuclear Research, where a Community approach to the problems raised by the peaceful use of nuclear energy is gradually being nurtured.

* * *

XIV. Among the other aspects of Euratom's activity during the period under review, mention may be made of the rapid rise in the number of Community patents filed. In 1961, 89 patents were granted out of a total number of 131 applications. The patents policy formulated by the Commission last year has undoubtedly eased the process involved in the conclusion of research contracts. The studies aimed at clarifying this policy as regards a number of special questions were continued.

The Commission has participated in the work undertaken by the member countries with the object of arriving at the establishment of new European industrial ownership rights.

With regard to the dissemination of information, the Information and Documentation Centre was set up in the course of 1961.

XV. As far as health and safety are concerned, the Commission has persevered in its task of ensuring compliance with the obliga-

tions laid down in Article 33 of the Treaty. While the situation is still not wholly satisfactory, the measures enacted by the Commission have resulted in the speeding up of the action being taken in the Member States to secure application of the basic standards in the near future.

The Commission has also gone further ahead with its work in the fields of background radiation monitoring, safety of nuclear installations, transportation of radioactive substances, and nuclear medicine and hygiene.

XVI. The Supply Agency has continued its activity under the supervision of the Commission and in close collaboration with its Consultative Committee. The Commission has drawn up a set of regulations, based on the provisions of Article 74 of the Treaty, concerning the transfer of small quantities of ores, source materials and special fissile materials.

XVII. Steady progress has been made in the fields of safeguards and controls within the Community. While in some very limited cases Euratom's supervision has given rise to certain differences of opinion as to the application of Chapter VII of the Euratom Treaty, the Commission anticipates that it will be possible to settle these divergencies in such a way that both the legitimate interests of the member countries and the letter and spirit of the Treaty are observed.

XVIII. With regard to the nuclear common market, two outstanding events have to be recorded.

On 5 March 1962, the EEC Council of Ministers decided, after consultation with the Commission, to maintain or fix at 10% the rates of duty shown in the common customs tariff applicable to reactors, parts and spare parts of reactors, and to deuterium and fuel elements, on the understanding that a partial or total suspension of such duties in the case of fuel elements would be applied as from 1 January 1962.

The draft directives formulated by the Commission on free access to specialised employment in the nuclear sector has been approved by the Council.

XIX. The Community's relations with non-member countries and international organisations have been further broadened and strengthened.

The framework agreement signed with Brazil makes provision for all possible forms of cooperation, for the Community as well as the member countries, persons and enterprises. A similar agreement is expected to be signed with Argentina in the near future.

The progress accomplished in the implementation of the US/Euratom Agreement for Cooperation has resulted in the negotiation of amendments which are shortly to be signed. On certain specific problems collaboration has been instituted with Canada as a third party. Cooperation with the United Kingdom has also been widened.

Finally, the lively interest taken by Euratom in the new principles underlying the Community's relations with the African States and Madagascar is evidenced by the Commission's active participation in the proceedings of the European Parliament aimed at establishing closer cooperation between these States and the Community.

XX. In March 1962 the United Kingdom and Denmark made official requests for the opening of negotiations with a view to possible membership of the Community. The Commission is studying the various aspects of this question so as to be able to give its opinion as provided by Article 205 of the Treaty. The Commission is convinced that these applications to join Euratom can help to bring about a more complete implementation of the objectives laid down in the Treaty and that simultaneous accession to the three Communities may represent a decisive step towards closer union between the nations of Western Europe.

XXI. The Euratom Commission is also aware of the role which devolves upon it, as well as upon the other two Executives, in the overall context of the economic and political unification of Europe—a role in which it has unflaggingly fulfilled its allotted task. The existence, activity and achievements of Euratom are, in the final analysis, only part of this vast design.

This effort can and must be sustained by consolidating and reinforcing what has already been achieved under the terms of the Paris and Rome Treaties, and by turning to full account the joint labours accomplished within the Commission.

The Commission remains firmly persuaded of the need to persevere in the building up of institutions which, on the foundations of the achievements which have already been attained, will endow Europe with a structure commensurate with the requirements of the modern world.

Like the European Parliament, the Commission is following with the keenest attention the negotiations entered into between the Member States for the creation of a Political Union in line with the Bonn Declaration of 18 July 1961. Both the useful experience acquired in the fulfilment of its task and the reflections prompted by major world events have strengthened its already firm belief that unremitting efforts in the building of the new Europe—which ensure the full development of the existing Communities and are being extended to other fields—remain an imperative necessity if Europe is to meet its responsibilities and assure its future.

CHAPTER I

RESEARCH

THE COMMUNITY RESEARCH PROGRAMME: RELATIONS WITH NATIONAL AUTHORITIES — COORDINATION OF NATIONAL RESEARCH PROGRAMMES. FACILITIES AT THE DISPOSAL OF THE COMMISSION: THE JOINT RESEARCH CENTRE — CONTRACTS. IMPLEMENTATION OF RESEARCH PROGRAMME: DEVELOPMENT OF REACTOR STRINGS AND ALLIED STUDIES — MATERIALS TESTING REACTORS — TRANSURANIUM ELEMENTS — NEUTRON MEASUREMENTS — CONTROLLED THERMONUCLEAR REACTIONS — BIOLOGY — FABRICATION AND UTILISATION OF RADIOISOTOPES AND MARKED MOLECULES — COMPUTER CENTRE AND SCIENTIFIC DATA PROCESSING CENTRE. OTHER RESEARCH: NUCLEAR PHYSICS — MINERALOGY AND GEOCHEMISTRY — ISOTOPIC GEOLOGY — DIRECT CONVERSION — WASTE PROCESSING — ACTIVITIES OF THE COMMISSION IN THE FIELD OF TRAINING (1)

I. Liaison with national bodies

A. *Research Survey (Article 5 of the Treaty)*

1. The Commission must keep particularly close track of the development and implementation of the various programmes undertaken by the Member States and enterprises of the Community in order to draw up its own programme, which is complementary to them. Under Article 5 of the Treaty, the Commission is empowered to obtain information and is at the same time

(1) While realising the importance of setting out the headings of its General Reports in the same order from one year to the next in order to provide the reader with a better overall view of the progress achieved in each particular field, the Commission has nonetheless been obliged to alter the structure of the chapter "Research" in the present report. The changes have been made in an attempt to provide a lucid and coherent picture of the development of the Community's research programme.

obliged to make adequate use of the information which it acquires.

The Commission's task in this particular sphere is made appreciably easier by the existence of the Consultative Committee for Nuclear Research set up by the Council and the Commission. The periodical meetings of the Committee enable comparisons to be drawn between various programmes and objectives and help towards the pooling of effort.

In September 1961, the Consultative Committee set up three ad hoc groups at Venice to examine programmes either under way or projected in the field of biology, fast reactors and the processing of irradiated fuels, and subsequently to put forward schemes coordinating the efforts being made by the individual states or to propose new plans enabling major gaps to be filled.

2. Furthermore, the Commission has continued to gather information from the various sources in question, particular efforts having been devoted to a thorough-going investigation of the facilities possessed by the nuclear designing firms as well as to an up-to-date survey of the progress made in the field of animal and plant radiobiology.

In addition, the detailed surveys of the Dutch and Belgian nuclear programmes have been kept up-to-date thanks to the collaboration of the Reactor Centrum Nederland (RCN) and the Commissariat belge à l'Energie atomique. A similar survey is being carried out in Western Germany with the aid of the Ministry of Atomic Energy and Water Economy and the Federation of German Industry (Bund der Deutschen Industrie), in Italy with the aid of the CNEN and in France with the support of the CEA. However, a great deal remains to be done before the survey can be regarded as a regular feature constituting a source of full information.

B. *Coordination of Programmes*

Facilities Available

3. Article 4 of the Treaty states that the Commission shall be responsible for promoting and facilitating nuclear research in

Member States and for backing it up with the Community's own research and training programme.

The Commission contributes to the development of the national programmes in the following way:

In the case of certain long-term, large-scale programmes it assists with projects which are already in progress, providing the additional resources required to ensure that the work can be carried out on a scale commensurate with its importance. By thus setting up joint teams with its partners, it enhances the Community nature of the undertaking from the viewpoint of its day-to-day activities, apart from the financial cooperation entailed.

As concerns more limited and specific projects, research and study contracts drawn up with the national industries or nuclear centres contribute to the extension of existing information and skills or, in cases where a new field is being explored, to the building up of a fresh body of knowledge from scratch.

To a certain extent and within well-defined spheres, these activities are already playing a part in the harmonization of the Community's efforts. However, the stage has not yet been reached at which the programmes can be drawn up in line with a predetermined coordination plan, a development to which the Consultative Committee for Nuclear Research should make a contribution.

Study Committees and Working Groups Set Up Pursuant to the Terms of the Treaty

4. The work of the study committees set up in accordance with Article 135 of the Treaty has been carried on in the normal manner (cf. 4th General Report, §§ 7-9 pp. 17, 18 and 19).

New groups were set up in 1961, both in the field of biology and to examine certain subjects connected with high-flux test reactors (irradiation costs, irradiation devices and capsule standardization). The objectives of these groups and their methods of approach are described below.

It is the Commission's desire that these working groups should have a completely free hand to operate in the most

flexible possible way. Created to fulfil a specific task, their existence, adjournment or dissolution are purely contingent on the developments which occur in their particular fields.

a) *High-Flux Reactors*

5. The "High-Flux Reactor Working Group" set up at the end of 1958 has paid particular attention to the stage reached in the construction and fitting out of hot laboratories and their auxiliary installations, and also to irradiation programmes.

It has recommended that special groups be responsible for examining questions relating to irradiation devices, testing costs and capsule standardization. In compliance with this suggestion, the Commission has set up the working groups mentioned in § d) below.

Furthermore, the group has agreed to carry out a more thorough examination of the possibility of constructing in the Community a hyperflux reactor, a project which, as has been emphasized, would be of particular interest.

b) *Dosimetry*

6. The "Dosimetry Working Group" has continued to collect the information acquired by the Community laboratories concerning the development of methods and apparatus for integrated flux measurements and for the determination of neutron spectra in reactors. The group is likewise responsible for promoting and coordinating systematic studies of these problems.

A further advance was marked by the establishment of conditions governing the use of detectors for thermal neutron dose measurements coupled with the completion of a joint study aimed at perfecting and standardizing detector preparation techniques.

c) *Hot Laboratories*

7. The proposal to arrange for regular meetings of hot laboratory experts, mooted in 1960, led to the creation, at the beginning of 1961, of a "Hot Laboratory Study Committee" made up

of representatives from those departments in the Member States' nuclear centres which are responsible for building and running these laboratories.

Within its terms of reference as a consultative body, this Committee examines projects, puts forward basic recommendations, studies general problems relating to construction work and equipment and also proposes measures aimed at the coordination and guidance of laboratory operation and the standardization of apparatus.

d) *Irradiation Capsules*

8. In line with the opinion voiced by the "High Flux Reactor Working Group" a group was set up at the end of 1961 to facilitate the exchange of information between specialists and to draw up recommendations for the standardization of irradiation capsules.

The first meeting of this group has already borne fruit in the form of proposals on standards for different types of containers used in the irradiation of targets.

Other groups have been set up to explore the possibilities of bringing irradiation prices into line and to facilitate the design and construction of irradiation devices.

Serious thought is being given to the creation of a group to consider questions bound up with the possible construction of a hyperflux reactor in the Community.

e) *Biology*

9. In conjunction with the Scientific and Technical Committee, a Special Consultative Committee was set up in 1961 to examine the Commission's general biology programme.

The Consultative Committee on Biology has met twice. Its first report, submitted to the Commission at the end of 1961, recommends that the peak effort in the biology programme contemplated by Euratom be attained within the shortest possible

time, and at the latest during the third year of the Second Five-Year Programme.

* * *

10. In this way, these experts' working groups provide a suitable atmosphere for the informal exchange of experience and information and for the improvement of working techniques, at the same time advising the Commission and the national instances on the slant to be given to the various programmes on which they are engaged in the interest of all concerned.

A major contribution towards the coordination of the work carried out is made by the contracts drawn up by the Commission, and in particular the contracts of association. These associations are gradually and in an ever-increasing number of fields giving birth to definite working communities encompassing all the research carried out in a particular field and supported, at both the policy-making and executive levels, by multinational teams made up of specialists from Euratom and all the Member States.

Information concerning these associations and the Commission's policy on contracts is given in Chapter III B below.

II. Facilities at the disposal of the Commission

A. *Activities Within the Joint Centre*

Ispra

11. The Italian Centre belonging to the Comitato Nazionale per l'Energia Nucleare (CNEN) was officially transferred to the Community on March 1, 1961, after a six months' transition period. For the time being, however, two of the laboratory buildings are being used by the Italian CNEN teams and the Ispra I research reactor will continue to be run by the Italians until 1963.

A programme of building construction was embarked on in the summer of 1960 in order to satisfy the increased need for laboratory space, workshops, testing sheds and offices and to extend the existing infrastructure.

Work has been begun on practically all the construction projects drawn up, which are being financed with the aid of a contribution of 9 million EMA units of account provided by the Italian Government. About a third of the buildings have been completed, and the remainder will be ready for occupation in the course of 1962. A further 15,500 m^2 will thus be added to the present laboratory and office space available.

In addition to various wooden buildings which are being used as temporary offices, the priority construction programme launched includes nine prefabricated metal buildings for laboratories and offices, the European Scientific Data Processing Centre, buildings for solids decontamination, metallurgy, health physics and technology sections together with a chemical laboratory and a central workshop. In addition, the existing laboratories were enlarged and the first stage in the construction of a European School at Varese completed.

This construction programme was parallelled by work aimed at improving the network of roads on the site and providing the Centre with the necessary infrastructure for the production and distribution of electricity and heat, water supplies, the processing of waste and telecommunications.

An acute problem this year was that of staff accommodation. It was to a certain extent solved by private initiative as well as through assistance provided by the CNEN and the Commission.

During 1961 a great deal of the equipment ordered in 1960 was installed in the laboratories as they were completed. The Ispra laboratories are now in possession of equipment which, from the standpoint of the problems to be tackled, is fully capable of adaptation to research developments and can even now stand comparison with that available at leading establishments of a similar nature.

The Ispra I reactor is being used by our departments in collaboration with those of the CNEN, while a certain amount of new and partly unique equipment has been installed.

12. The corner-stone of the Ispra Centre's programme is the ORGEL Project, an overall description of which is given below.

The departments dealing with reactor physics, metallurgy, technology, heat exchange, physical chemistry and chemistry are those most intimately connected with the ORGEL Project (see §§ 27 et seq.).

Euratom's fast reactor pogramme is based on various contracts of association, but Ispra will also assume various tasks under this heading (theoretical neutron studies, devices for use in fast-neutron experiments, research into heat exchange by liquid metals) (see §§ 20 et seq.).

A computer group and a logic group are working on high-performance digital and analog computers.

Alongside these main fields, small groups have also been created for nuclear physics, direct conversion, mineralogy/geochemistry and waste processing studies. The waste-processing study group, in particular, is grappling with the problems which will shortly be raised by the production at Ispra of ever-increasing quantities of radioactive effluents.

Under the programme of collaboration between Euratom and the CNEN, a cold-neutron chopper was installed in 1961 and work on the construction of a magnetic mirror for polarised neutrons is almost completed.

Ispra is also responsible for the administration of numerous research and association contracts which dovetail with these activities.

Petten Establishment

13. An agreement signed between the Netherlands Government and the Commission in July 1961 covered the transfer to the Commission of a site situated partly within the precincts of the plant operated by the RCN at Petten, as well as of a high-flux materials' testing reactor, on which low-power tests were recently begun.

This agreement will come into force during the next few months on ratification by the Dutch States-General. The practical terms governing this transfer are now being drawn up by the interested parties.

In the course of the next four years, the RCN will be responsible for the technical operation of the reactor, the working programme of which will be laid down by a Joint Board (as at Ispra), on the understanding that the Dutch programmes will be accorded priority during the transition period.

The programme was drawn up in 1961 in collaboration with the neighbouring Dutch establishment.

The programme for the immediate future provides for, in particular, the construction of a large technology workshop and a building to house the laboratories and administrative sections. The ground will be broken in 1962.

14. A five-year development programme has been drafted for the Petten establishment. As was pointed out in the introduction, the programme will be centred on the high-flux reactor but the Commission also intends to entrust the establishment with the execution of further studies on the use of thorium.

Although fairly general in scope, the problems to be tackled will be linked up with the activities already being under way in this field, such as the DRAGON Project and probably the BBC/Krupp Project. High-temperature gas reactors do in fact constitute one of the most promising possibilities for the use of thorium.

The implementation of this programme, which will deal in particular with graphite and the maintenance of active circuits, will call for a large number of irradiation experiments, and it is for this reason that the operation of the high-flux reactor must be regarded, from the standpoint of the scientific programme, as one of the establishment's most important activities.

Karlsruhe Establishment (European Transuranium Institute)

15. The plans for the Karlsruhe establishment are slowly maturing. The appointment in October 1961 of the director of the European Transuranium Institute has helped to coordinate the preparatory work carried out in Brussels and Karlsruhe.

Taking into consideration the Community's plutonium use programmes and the research facilities at the disposal of the national laboratories, an initial estimate was carried out of the provisional staff and material requirements, on the basis of which a preliminary draft design was drawn up for the Karlsruhe Centre. In March 1961 this draft design was submitted to the German authorities to which application for the building permit has been made.

An international architectural competition organised in the course of the year was won by a German architect, who will participate in the final designing and construction of the project.

In addition, a group of European industrial construction companies was asked to make a critical study of the initial draft design, while specialists from the Commission and the Kernreaktorbau- und Betriebsgesellschaft, Karlsruhe, took an active part in the drafting of a detailed draft design for the laboratory and in finalizing construction procedures.

On the basis of this preliminary work, the final drafts design was finished in January 1962; construction work should begin in July 1962.

16. The activities of the European Transuranium Institute will be focussed on plutonium.

The goal to be aimed at is the development of fuel elements for burning plutonium in both fast and thermal piles, the emphasis being laid on the former type.

Furthermore, considerable stress will be placed on material studies and irradiation tests, which mark the first stage in the development of a reactor string.

These activities will take clearer shape as the Commission's work on the "reactor programme" progresses (see §§ 20 et seq.).

Geel Establishment (Central Nuclear Measurements Bureau)

17. An agreement was signed in June 1961 between the Belgian Government and the Euratom Commission providing for the definitive establishment of the Central Nuclear Measurements

Bureau at Geel. The Bureau will thus have at its disposal an area of 75 acres on one of the sites of the Belgian plant, together with a building already in existence. Furthermore, the Belgian Government has appropriated one million EMA units of account for the construction of other buildings and to complete the infrastructure.

During 1961 the work on the establishment of the Bureau was continued in accordance with the programme drawn up in 1960 by the Commission after examination by the Scientific and Technical Committee. An important part of the activities consisted in the detailed preparation of the orders for the supply of large apparatus (linear accelerator, mass spectrometer), together with their measuring devices, and in the drafting of construction bleuprints.

A hangar to house the 3 MeV Van de Graaffaccelerator is now under construction, and the apparatus should be put into operation in May 1962.

A powerful linear accelerator, which it is planned to put into operation at the end of 1963, has been ordered, together with five 4096-channel-time-of-flight analyzers.

The Euratom research programme defines the BCMN as a standards bureau specializing in nuclear measurements, such as isotope dosage, absolute irradiation measurements, neutron absorption, etc. For this reason it is essential that it be provided with adequate facilities.

It is the function of a standards bureau to carry out measurements of physical constants to a very high degree of accuracy and to endeavour to improve upon existing measuring methods. The very nature of these activities points to the need for research into the science of physical measurements.

18. Now that these four establishments are in operation, the Commission has no immediate plans for setting up any new ones. This situation, however, might be somewhat altered by the entry of other countries into the Community.

Notwithstanding their geographical dispersion, these establishments are intended to form a cohesive Joint Centre.

The programmes entailed (including those incorporated in contracts of association) are planned and distributed in a coordinated manner, a system which likewise applies to all decisions taken on staff policy. In this connection, it should be stressed that in no instance is there an abnormally high proportion of research workers of local nationality at the establishments of the Joint Centre.

In line with the terms of the Treaty, the activities of the Joint Centre are complementary to the national programmes. The same principle is to be applied to the Joint Centre establishments, the Commission making every effort to ensure that, as is done with respect to the national programmes, all duplication of work is avoided inside its own departments. For this reason the Commission was guided in the allocation of programmes by the need to provide each establishment with a very clearly defined objective. This is particularly necessary in the case of general-purpose establishments, where virtually anything is possible—which does not, however, necessarily mean that everything is permissible at any time. The essential factor in setting up programmes is to maintain a balance between work which has a definite, more or less immediate object, and that bearing more on general studies. The former helps to create team spirit, while the latter provides for intellectual freedom.

None of the Joint Centre establishments has yet really got into gear, but the construction and installation work has forged ahead at a brisk pace and the teams have been recruited to the extent permitted by budgetary considerations. Pending the final installation of the Petten and Karlsruhe establishments, the Commission has focussed its efforts on Ispra and Geel.

19. The present General Report contains a description of the scientific and technical work carried out by the teams which were already in existence in 1960 and which have since been strengthened by the recruitment of new staff. The groups were able to start work as the new buildings became available, having prior to that been compelled to confine themselves to the preparation of their projects and the technical administration of contracts.

This was particularly the case during 1961 as regards chemistry, technology and the European Scientific Data Processing Centre. While the shortage of laboratory space continues to raise a number of difficulties, it can nonetheless be stated that all departments have now been supplied with their basic equipment and have commenced work, the results of which are beginning to be reflected in patent applications and scientific publications in a wide range of fields.

B. *Activities Outside the Joint Centre*

20. As in previous years, the national industries and research centres have been closely associated with the Commission's activities in the field of industrial research, design and construction projects, a fact which is borne out by the 124 contracts awarded by the Commission in 1961.

The work which this entails for the Commission should not be underestimated, either from the administrative (discussion of texts and financial administration of contracts) or the technical angle (drafting of programmes, current technical administration, evaluation of results).

In giving firm backing to the most efficient research centres and industrial concerns, the Commission must, however, spare no effort to ensure that development follows a coherent pattern. The Commission is particularly alive to the need by making allowance for future requirements, to avoid the creation of an excessively large or dispersed capacity and to facilitate adaptation to the conditions of the emergent nuclear common market.

In addition to a certain number of contracts concluded in fields which have no specifically scientific or industrial import, the contracts concluded by the Commission in 1961 break down as follows:

Scientific or Industrial Field	Number	Total Cost to Commission for Duration of Contract
Research and Development Programme under the US/Euratom agreement	34	4,77
Orgel	29	5,23
Fast Reactors	2	0,45
Controlled Thermonuclear Reactions (Fusion)	1	2,50
Biology	7	6,60
Transplutonium Elements	4	0,73
BR 2 High-flux Reactor (supplementary Contracts)	3	0,02
Scientific Data Processing (CETIS)	10	0,48
Marked Molecules	7	0,05
Isotopic Geology	2	0,90
Nuclear Propulsion for Merchant Shipping	6	4,94
Participation in Power Reactors	3	19,00
Radioisotopes (Industry)	2	0,07
Contracts concluded in Connection with the Joint Centre establishments at Ispra and Geel		
a) *Geel*		
Physical Measurements	2	0,77
b) *Ispra*		
Geology	3	0,04
Hydrobiology	1	0,03
Metallurgy	1	0,01
Reactor Physics	3	0,26
Contracts for Studies Relating to Reactors	4	0,14
TOTAL :	124	46,99

A detailed list of these contracts is annexed to the present General Report.

III. Execution of research programme

A. *Development of Reactor Strings—Allied Studies*

21. For a long time now, research centres the world over have been investigating the possibilities offered by fast breeder reactors. Their preoccupation is largely explained by the following facts:

1) A feature of the fast reactor is that it enables more fissile material (plutonium or uranium 233) to be produced from

a fertile material (uranium 238 or thorium 232) than it consumes, a principle which makes it theoretically possible to use the world's entire uranium and thorium reserves for the production of energy.

2) The preliminary studies carried out to date give good reason to hope that the power plants of the future will reach an acceptable price per installed kilowatt.

3) Fast reactors permit the optimum nuclear use to be made of plutonium rich in the higher isotopes, which is produced in large quantities by thermal reactors and in particular by gas-cooled graphite-moderated natural uranium reactors.

It is largely for these last two reasons (coupled with the need to tackle immediately the problem of keeping an expanding economy supplied with energy) that the Americans, French and British have decided to embark on the development of a fast string as soon as possible.

22. Within the Community, the two national research centres at Cadarache and Karlsruhe are devoting considerable funds to this development, while a private Belgian company, Belgonucléaire, has trained a nucleus of specialized engineers since 1956.

The programme which the French Atomic Energy Commission (CEA) has been carrying out since 1958 is centred on the study of sodium-cooled fast reactors, in which the fuel, which has a relatively low level of enrichment, would permit a very high burn-up rate due to the "breeding" of fissile material inside the core. The first objective is the construction at Cadarache of the 20 MWth RAPSODIE reactor, which is expected to go critical in mid-1964 as soon as a comprehensive research and development programme has been carried out.

The preliminary studies carried out at Karlsruhe since the end of 1960 have been focussed on the evaluation of a wide range of reactor concepts. On the basis of these studies, it will be possible to establish a series of economically promising fast reactors on which the establishment's activities will be centred from 1963-64 onwards.

Back in 1960, the Commission recognized the importance of providing the Community with a fast-neutron critical assembly, which at that time was not covered by any of the national programmes. On the basis of preliminary studies carried out by Belgonucléaire, the chief characteristics of a machine which had been proposed were established and the broad outline of a draft design then sketched out. Close collaboration was established between the Commission's contractor and the French CEA.

Work connected with the detailed design will be intensified in 1962, in conjunction with Commission and CEA specialists. Close contact is also being maintained with the experts at the Karlsruhe Centre.

23. It was not the Commission's intention to confine itself to this touchline participation. It had long been its opinion that the scale of the resources required for the development of a fast string, coupled with the inchoate nature of all the projects undertaken in this direction by the Member States, provided ideal conditions for a joint offensive. This reasoning underlay the proposal put forward by the Commission as early as 1959 that all fast-reactor studies should be dealt with in the framework of contracts of association, but it was not until 1961 that these suggestions met with a favourable response, first of all in France and then in Germany.

The Commission therefore immediately embarked on negotiations with the French CEA with a view to drawing up an extensive contract of association, the primary aim of which would be the design, construction and operation of the RAPSODIE reactor and a fast-neutron critical assembly. This was to be followed up within a short space of time, by a second contract relating to design studies coupled with research and development work on a prototype reactor of about 100 MWe.

The talks with the German authorities are slated to begin in the near future. During the first stage of the contract, the programme will probably be limited to physical studies, the German authorities not proposing until later that the association be amplified to cover technological problems.

Acting on a recommendation put forward by the Consultative Committee for Nuclear Research at its meetings held on 23 and 24 January 1962, the Commission is planning to set up at Karlsruhe a second fast-neutron critical assembly which would share a limited stock of plutonium with the Cadarache plant.

The results of the evaluation work carried out at Karlsruhe will form the basis for the part to be played by the Germans in a future Community programme. If the Centre gives birth to a series of reactors similar to that envisaged in the programme covered by the Euratom/CEA contract of association, the concentration of the Community's endeavours on one type of reactor will lead to an appreciable increase in the rate of progress. Should the Karlsruhe Centre decide on a different reactor string, the pursuit of these parallel activities under a new contract of association would open up to the Community broader vistas in the field of technology but would at the same time mean a delay in the selection of the industrial prototype for a fast-reactor nuclear power plant.

The principles underlying the major part of the British and American programmes follow the same lines as those envisaged by the CEA, a situation which holds out good prospects for cooperation on an international scale. Very close collaboration has already been established with the UKAEA in the sphere of critical assemblies, while a very frank spirit of cooperation likewise marks our relationship with the USAEC. Both these bodies are prepared to negotiate with the Commission on the conditions for the supply of the plutonium required.

24. Inasmuch as the policy of association cutlined above is successful, the Joint Research Centre will not embark upon any ambitious fast-reactor programme. However, it is obvious that the Commission must have at its disposal sufficient know-how to back up an independent judgment. It must therefore gradually adjust its own activities to those undertaken under the contracts of association into which it enters. Hitherto, these activities (apart from the contract studies on critical assemblies, referred to above)

have been connected with certain research projects carried out or planned at Ispra, viz.:

— a Monte Carlo calculation method applicable to fast-neutron systems;

— the planning of diffusion tests on a uranium-plategraphite assembly;

— basic studies on heat transfer by liquid metals;

— dry chemical reprocessing studies, which might be linked up with the research carried out on the processing of fast-reactor fuels.

In 1961, therefore, the activities of the Commission and the Member States in the field of fast reactors, took firmer shape. The same applies to the first direct measures adopted by the Commission, which, dovetailing with the national projects, will form an integral part of the contracts of association subsequently drawn up or will be coordinated with them.

A.2. *High-Temperature Reactors*

DRAGON Project

25. As is indicated in the second annual report on the Project published by the European Nuclear Energy Agency, work on the construction of the Winfrith Heath reactor proceeded satisfactorily. The policy of having research work carried out under contract was continued and in 1961 a total of 36 new research contracts and 77 supply contracts were drawn up, 14 and 17 respectively being awarded to firms or research centres within the Community. At the same time, 64 scientific and technical reports were published on the results of the research carried out hitherto.

The Agreement for Cooperation drawn up with the USAEC in 1960 proved to be extremely beneficial to each of the parties concerned, offering as it did numerous opportunities for exchanges of information backed up by visits on both sides.

As in previous years, the Commission has endeavoured to ensure that the countries of the Community be closely associated

with the activities of the Project through the agency of their technical correspondents. The aid rendered by this network of correspondents was particularly useful in enabling firms and laboratories within the Community to take part in the calls for tenders issued by DRAGON and to offer their services for the execution of research or study contracts.

The DRAGON Agreement is due to expire on 1st April 1964, when construction work on the reactor will no doubt be completed, although it is hardly likely that the Project will have had time to carry out the initial operating trials. Being particularly interested in extending the agreement, a move dictated by its natural anxiety to take part in these trials and thus to reap the fruits of a project to which it has given considerable support, the Commission brought the matter up for discussion in 1961. The Commission considers that the negotiations on this should take shape as soon as possible, for it is on their outcome that the general pattern of the programmes for the remainder of the first period of collaboration would directly be based.

The first discussions on the technical scope and the conditions of an extension agreement were conducted by the Project's Management Committee in 1961. At the end of the year, the Committee set up a working group whose task would be to report to it on the progress of the Project and on any future activity calculated to promote the attainment of the Project's objectives. The recommendations put forward by this working group are shortly to be submitted to the Management Committee, which in turn is responsible for putting them before the signatory countries.

BBC/Krupp Project

26. For several years now the German firm BBC/Krupp Reaktorbau GmbH has been engaged on the design of a reactor experiment possessing features similar to those of the DRAGON-type but distinguished by certain original characteristics.

A start was recently made on the construction of the reactor at the Jülich Nuclear Centre with the collaboration of the Federal Government and a group of electricity producers (Arbeitsgemeinschaft Versuchsreaktor — AVR).

In view of Euratom's active participation in the construction of the high-temperature gas reactor at Winfrith Heath and the substantial exchange of information to be carried out between BBC/Krupp and the promotors of the DRAGON Project, it would be most desirable for the Commission to link up with the BBC/Krupp - AVR research and development programme. Overtures were made in this direction back in 1958, but they did not meet with any response until 1961, when negotiations were initiated.

Should these negotiations culminate in an association between Euratom and the BBC/Krupp Project, the Commission will have succeeded in establishing a network of cooperation linking up all the advanced gas-reactor projects now in existence throughout the world. An immediate effect of this collaboration would be an appreciable reduction in the total cost, and in particular would shorten the time required for overcoming the main difficulties raised by this type of reactor.

A.3. *Homogeneous Reactors*

27. The studies commenced in 1959 in association with the Dutch firm KEMA (NV tot Keuring van Electrotechnische Materialen) in the field of homogeneous suspension reactors were continued and have yielded some valuable results concerning the irradiation behaviour of uranium and thorium oxide suspensions.

This work was carried out largely thanks to the excellent spirit of collaboration existing between the Harwell and Mol teams. A similar most satisfactory understanding was also established with the nuclear study centre at Saclay with regard to reactor physics.

Discussions are at present being held concerning the future of these studies, with particular reference to the possibility of building a reactor experiment.

A.4. *Natural or Slightly-Enriched Uranium Reactors*

ORGEL Project

General Outline of Project, Technical and Economic Advantages

28. It will be recalled that at the end of 1959 the Commission embarked on the first studies connected with heavy water-moderated, organic liquid-cooled reactors. The decision to go ahead with these projects was mainly based on a recommendation put forward by the Scientific and Technical Committee which, at a meeting held on 28th April 1959, expressed the view that the Commission should undertake a study of this reactor type, the possibilities of which had been insufficiently explored.

The advantages which this reactor string may afford partly derive from the fact that, due to the absence of economic sources of enriched uranium in the Community, the closest examination must be made of any technique involving the use of the natural variety. On the other hand, despite the large number of unknowns, the ORGEL design is such that wide use can be made of proven methods and well-known, inexpensive materials, while a further advantage resides in the lower investment cost due to the low pressure feature. Studies have shown, moreover, that a relatively high electric power might be expected by virtue of the high outlet temperature of the coolant, as long as an appropriate steam cycle is used.

It should not be forgotten, moreover, that the methods considered for the ORGEL string enable the optimum use to be made of the industrial potential available in Europe and at the same time permit a highly useful exchange of experience with certain centres engaged on allied projects outside the Community, particularly in Canada.

The Commission, however, is fully aware that the development of any string is fraught with countless uncertainties. It was with an eye to these difficulties and in an effort to arrive at a more accurate assessment of the economic value offered by the ORGEL string that the Commission drew up in January 1962 a

contract with a group of industrial design firms aimed at establishing in detail the cost of the various items and determining the price conditions.

Research and Development Programme

29. The Fourth General Report (for the financial year 1960) referred to the large-scale Research and Development Programme undertaken to remove some of the doubts still clouding the industrial future of the ORGEL string.

This programme, launched in 1960, was considerably amplified in 1961, and although the Joint Centre establishment at Ispra began to play a part in it commensurate with its capacities, a major portion is still being carried out under contracts concluded with national bodies within the Six. The majority of the contract work initiated in 1960 has been extended and 29 new contracts were granted in 1961 to public and private national research centres. These are now being carried out in collaboration with the engineers of the Joint Research Centre at Ispra.

Chemistry

30. The main body of the work is concerned with studies on organic coolants, with particular reference to polyphenyls. One of the major problems which they raise is bound up with the fact that, under the action of heat and radiation, they decompose, giving off gases, lighter products due to breaking of the molecule chain and heavier products due to polymerization. An exhaustive chemical programme has been launched in an attempt to throw light on the mechanism governing this decomposition.

An in-pile loop has been in operation for more than a year in the Mélusine reactor at the Grenoble Nuclear Research Centre, while a second is to start working in the spring of 1962. Both these devices will be used to study the irradiation behaviour of organic coolants up to a temperature of 450°C.

Work was also continued on research into new organic coolants. These studies are aimed at the development of products possessing lower vapour pressures than triphenyl and capable of superseding it.

Neutron Physics

31. The combination of organic liquid and heavy water in the ORGEL lattices poses major optimization problems, bearing mainly on the thermal utilization factor and the increase in resonant absorption due to the presence of a hydrogenated moderator inside the fuel element.

Experimental studies were carried out in the Aquilon reactor in 1960 with metallic plate-elements, and tests on uranium oxide are now in progress. These studies will be amplified with the aid of the ECO critical experiment, to be installed at the Ispra Centre (cf. § 35).

Heat Transfer

32. A series of studies was begun to check the relations governing the prediction of the forced convection heat transfer coefficient and to study surface fouling by pyrolysis and burnout.

A detailed study into the problem of fouling was initiated by the construction of automatic loops operating at a very high temperature and by basic research on physical chemistry.

At the same time, various devices were developed for measuring the physical constants of organic substances under operating conditions.

Technology

33. This part of the programme is carried out entirely by Ispra research workers, who, in addition to their other activities, are responsible for supervising the execution of a large number of contracts. One loop is in the designing stage, while for technological tests a further loop is to be built in an attempt to reproduce the conditions obtaining in an ORGEL channel.

Special studies are now in progress on aluminium and silicon materials in an endeavour to devise a solution to the technological problems raised by pressure tubes. A test stand is now being built for channel joint examinations. The question of friction and abrasion in the channel is also being investigated.

Metallurgy and Fuel Elements

34. This part of the programme is also in the hands of the appropriate section at Ispra, 90% of whose activities are directed at problems relating to this field. At the same time, it is responsible for supervising a large number of contracts.

Fuel studies are centred on uranium carbide, for the initial experience gained in our laboratories at the Joint Research Centre ant the first data to be published on the subject show that this fuel is likely to offer an irradiation behaviour comparable to that of the oxide. Moreover, its greater density of fissile atoms would seem, as a first approximation, to represent an advantage over the oxide from the neutron angle. Its good thermal conductivity, compared with that of the oxide, coupled with the absence of phase transformations, give reason to believe that the central temperature of the rod will not inhibit performance.

Research on cladding is mainly concerned with different types of sintered aluminium.

The programme is rounded off by a series of conventional measurements, non-destructive tests and irradiation tests (in-pile creep behaviour).

Design and Construction Work

35. In order to lend experimental support to the teams now working on the neutron calculations for heavy water-organic liquid lattices, the design study of a critical experiment christened ECO (Expérience Critique ORGEL) was launched at the beginning of 1961. In April, a call for tenders was issued within the Community for a detailed draft design. The reactor was ordered at the end of 1961, so that installation work could be begun in the autumn of 1962 and criticality reached around 1st July 1963.

Furthermore, in view of the impossibility of designing a power reactor without preliminary full-scale tests representing the processes which occur in the channel of an ORGEL reactor, the Commission is planning to build a specific test reator at Ispra.

The plant in question, known as ESSOR (ESSais ORgel), is a pressure tube reactor, i.e. containing an assembly of coolant channels, the overall behaviour of which constitutes the largest unknown in reactors of the ORGEL type.

ESSOR, as well as containing several experimental channels, four of which are intended for special tests, will be designed with a view to later use for the study, in favourable conditions, of further heavy-water strings.

At the beginning of 1961, about ten European design firms were approached in connection with the drawing up of a draft design. Several of them have formed groups in compliance with a suggestion put forward by the Commission. After two of these groups had been asked to submit an initial draft design, one of them was selected to elaborate a detailed design to be ready for submission in October 1962.

Pending the decision to go ahead with construction, expected for the end of 1962, studies are being carried out with a view to finding an alternative solution. Loops installed in the Community's test reactors will be used to obtain the most significant possible irradiation results. Since they cannot, however, be equivalent to those supplied by ESSOR, attempts are being made to determine whether they save sufficient time and money to offset the technical drawbacks inherent in this solution.

Euratom/Canada Agreement

36. The bonds of cooperation between the Commission and Atomic Energy of Canada Ltd. were strengthened in 1961, with most satisfactory results. In June 1961, the Committee set up under the Agreement organized a meeting at Ispra, at which the experts held a lively exchange of views on the subject of heavy water-moderated, organic liquid-cooled reactors.

The presence of American experts at this meeting is especially noteworthy. The Americans and Canadians have in fact offered to modify the separate Agreements linking the AECL with the Commission and the USAEC respectively, by placing

them on a three-cornered basis, thus offering the Community access to such major projects as the American OMRE, EOCR and HNCTR reactors, etc.

Technical collaboration was furthered by exchanges of visits and by the elaboration of a joint irradiation programme in the Canadian NRX-reactor.

Halden Reactor

37. In 1961 the bulk of the work at Halden was focussed on the appreciable alterations required to make it possible for the reactor to be loaded with a second core of ceramic-based fuel elements.

The European Energy Agency has published the second annual report on the project, but the signatory countries have been kept regularly informed of the progress achieved by the quarterly reports and by meetings held between Commission officials and the national technical correspondents. The Commission need therefore only refer to these publications (cf. Second Annual Report on the project, published in April 1961 by the ENEA, and quarterly progress reports HPR 13, 14 and 15 published by the Institutt for Atomenergi at Halden).

The present period of collaboration is due to end on 31 December 1962. The Project Management has put forward fairly ambitious proposals for its extension, which have been received with considerable reserve at ad hoc meetings and discussions held by the Halden Committee and the Technical Group.

The assistance of the technical correspondents designated by the Community countries has proved particularly valuable for the examination of these proposals.

Water Reactors and Allied General Studies—Euratom/US Agreement Research and Development Programme

38. This year again, the Euratom/US Joint Programme was hampered by difficulties encountered in the implementation of the power plant construction programme. At the present time

only the SENN boiling water plant is under construction, the pressurised water plant project not having been officially submitted by the SENA until the end of 1961. Almost all the contracts authorized in 1961 therefore had to be restricted to studies relating to the boiling water reactor string. At the same time, however, it proved possible to consolidate certain general projects launched in the preceding years.

The Joint Board authorized the negotiation of 16 new research contracts and 7 extensions in the Community and the US. Since it was first begun, the total cost of the Euratom/US Joint Research Programme amounts to $ 12 million and 5,500,000 for the Community and the US respectively.

This difference will be corrected in 1962 largely due to the fact that a major part of the development programmes, one of which relates to the stepping-up of the power of the SENN plant and the other to the construction of the SENA reactor, is to be carried out in the US.

The chief research studies now under way are enumerated below, and more detailed information being provided in the "Joint Research and Development Program Quarterly Digest".

1. *Nuclear Fuels and Materials*

39. The uranium oxide programme is aimed primarily at the investigation of various shaping methods.

Extrusion test results have demonstrated the possibility of fabricating rods with an average density of 96 %, while the influence of parameters which are of major importance from the viewpoint of production on a semi-industrial scale was likewise determined.

At the same time, work is being carried out to devise better ways of preparing and shaping uranium oxide powders and to examine the basic properties of this material. The limit conditions for the use of uranium oxide in a reactor will be able to be established on the basis of tests concerning its behaviour at reactor power densities which cause partial melting of the fuel.

Useful results have been obtained from research into several processes for preparing and shaping uranium monocarbide powder.

A research study now in progress in the US and aimed at establishing the properties of uranium mononitride as a nuclear fuel is proceeding satisfactorily. Several samples have been fabricated and are now being examined after irradiation in the MTR reactor.

Work is being carried out both in the Community and the US on the development of cladding materials of low neutron absorption and improved mechanical properties and corrosion behaviour in water at high temperatures. Very encouraging results have been obtained with the alloy Zr-3 %Nb-1%Sn, and very long-term corrosion tests have been completed.

2. *Structural Materials*

40. Tests on structural materials have so far been confined to high-thickness steels for reactor vessels. An overall programme is now being worked out, and the utmost advantage is taken, in the major projects which have been launched, of the experience acquired by the Community's steel industry.

The purpose of the programme is to supply Community producers with the information essential for the design and construction of nuclear plant vessels and circuits.

3. *Thermodynamics and Hydrodynamics of Liquids*

41. Research into hydrodynamics and thermodynamics is proceeding in a satisfactory manner. Significant results were obtained from studies of the promising new technique involving the use of watersteam emulsions as a coolant.

Out-of-pile loop tests were carried out to study the corrosion resistance of stainless steel and zircaloy-2. This work is being continued in an attempt to determine the optimum conditions, from the corrosion resistance angle, for the use of watersteam mixtures.

In addition, valuable results were obtained from a study aimed at improving the heat exchange coefficient and the burnout flux by setting up whirlpool currents in the coolant.

4. *Various Research Projects*

42. Finally, work was conducted on the halogenation of ceramic fuels (irradiated uranium oxide and carbide) and on waste processing.

* * *

43. The participation of Euratom personnel in the work pertaining to the contracts awarded both in the Community and to US firms was considerably hampered by recruiting restrictions. The number of American research workers taking part in the work carried out in the Community, although very low in absolute terms, has undergone a relative increase. During the period 1960-61, a total of 25 Euratom engineers participated (seven of them in the US) in the research work performed under the Joint Programme.

During 1961-62 this number totalled 21, four of them in the US, while the number of American enrigneers employed under contracts awarded to enterprises within the Community rose from one in 1960-61 to four in 1961-62.

B. *Materials' Testing Reactors*

BR-2 High-Flux Reactor

44. Under the terms of the Agreement signed in June 1960 between the Commission and the Centre belge d'Etude de l'Energie nucléaire providing for the joint operation of the BR-2 reactor and its auxiliary installations, the parties were to stipulate, by common consent, the date after which they regarded the plant as completed and ready to be put into operation. This

date would mark the end of the transition period and the transfer of the plant to a joint management committee.

After preliminary trials and tests, the reactor went critical in July 1961. This experiment, which was essential to confirm the validity of the nuclear physics studies, was particularly succesful. The equipment as a whole proved satisfactory and there is every reason to hope that the reactor controls will offer a considerable degree of flexibility. In view of the encouraging nature of the results obtained, the reactor came under joint management on 6 July 1961.

The second quarter was devoted to the installation of the various instrumentation and control equipment and to the preparation of the trials and experiments which must be completed prior to power operation.

The start-up schedule will be carried out in 1962 on a step-by-step basis.

At the same time, further headway was made with the design and construction of hot laboratories.

Work was completed on the construction of a medium-activity hot laboratory. Hot cells were designed and the orders for their construction placed with various industrial firms.

Plans were drawn up for a very-high-activity laboratory and industrial concerns within the Community were asked to submit draft and final designs. Site preparation could begin in 1962.

The first experimental use to be made of BR-2 will be for irradiation experiments requested by several national research centres both within the Community and in Third Countries.

Various bodies have placed orders for irradiation loop design studies, which are now being carried out either under the Euratom/CEN Association or in conjunction with industrial undertakings.

A Joint Management Committee, made up of three members of each of the parties was set up, to assume responsibility for

operational supervision and for the approval of programmes and expenditure.

Petten HFR High-Flux Reactor

45. The Netherlands Authorities were obliged to commence criticality tests slightly later than scheduled due to welding flaws in the reactor vessel and the lining of the swimming-pool.

However, criticality was reached by the RCN on 9 November 1961.

It should be recalled that the RCN remains the sole proprietor of the reactor until ratification of the Petten Agreement and will be responsible for its management for four years after that.

C. *Research into Transuranium Elements*

C.1. *Work Programme of Karlsruhe Institute*

46. Reference has already been made in the preceding pages to the progress achieved in 1961 in the way of providing the European Transuranium Institute with the laboratories it needs for the prosecution of its tasks.

Pending the construction of these laboratories, the emphasis hab been laid on the preparation of the working programme and the recruitment of a nucleus of research workers, who, before joining the Karlsruhe staff, would complete their training on special courses abroad or would participate in the work carried out by the laboratories maintained by the individual Member States in fields related to that which forms the basis of the activities of the Karlsruhe Institute.

Under the assignment laid down by the Commission, the Karlsruhe Institute will play an important part in the overall research activities devoted to the transuranium elements, which are based on the studies carried out under the Community's programme and also on the coordination of the projects undertaken by the Member States in this field. Under the terms of

the Agreement establishing the Institute, the Karlsruhe establishment is to become the fulcrum of all the Commission's activities concerning transuranium elements.

The Karlsruhe laboratory ill be mainly engaged on plutonium studies, and in particular the development of plutonium-based fuel elements for all reactors in which they can be used.

As regards plutonium metallurgy, the main stress will be laid on technology, and basic studies on plutonium and its alloys have in fact been in progress in all the specialised laboratories for several years now.

Our knowledge of ceramics is considerably more limited and whole categories of compounds (such as the nitrides) have been relatively neglected up to now. For this reason top priority must be given to basic studies in this field.

A fundamental part of the programme will also be devoted to fuel elements technology. Tests involving a thorough examination of irradiation effects constitute a prerequisite for the development of fast plutonium reactors requiring high burn-up rates and power densities.

As far as basic studies are concerned, two fundamental methods of approach should be singled out for special mention:

— short-term in-pile irradiation of high-purity samples;

— bombardment by particles, and especially electrons.

The chemistry programme will bear particularly on analysis, burn-up rate measurement and plutonium recovery.

C.2. *Plutonium Recycling*

47. The weight attached to the plutonium research provided for in the Euratom/US Agreement for Cooperation was reflected in Euratom's request—granted by the US after a vote in Congress—that the amount of plutonium made available for joint research projects be increased from one to nine kg.

From the standpoint of research carried out under contract, the year 1961 was to a certain extent a period of transition marked,

at Cadarache, by the completion of the workshops intended for the fabrication of plutonium-based fuels and at Mol by the fitting-out of new laboratories with equipment design for the handling of plutonium compounds in inert atmosphere. The delay thus entailed in the programmes laid down in 1960 at the same time as providing the Mol technicians with a breathing-space for the acquisition of valuable experience, gave the CEA staff the opportunity to revise its experimental programme aimed at determining the integral neutron values of plutonium-based fuels in various lattices in the light of the results obtained at Hanford, in particular. Bearing in mind the resources available and the size of the CEN and CEA teams, we can confidently look forward to speeding up this work from 1962 onwards.

The research embarked upon by the CEA is especially concerned with the development of dispersed ceramic fuels and the fabrication, shaping and irradiation of plutonium-based alloys.

The studies allotted to the CEN (in association with the Belgonucléaire Company) bear mainly on technology studies dealing with ceramic fuels dispersed in a metallic matrix of low neutron absorption and with mixted uranium and plutonium oxide and carbide-based fuels.

About 15 Euratom employees, university-trained personnel and technicians, are taking an active part in the research entrusted to the CEA and CEN. Furthermore, the USAEC has given its agreement in principle to the secondment of a Euratom engineer on a long-term assignment to the plutonium metallurgy department of the Hanford laboratories. Among the highly useful visits paid to Hanford, special mention should be made of the six-week stay at the laboratories which was arranged by the Commission for two CEA engineers and which led to the establishment of close contacts with specialists engaged on the study of neutron problems bound up with the use of plutonium in thermal reactors.

C.3. *Research on Transplutonium Elements*

48. The European Transuranium Institute at Karlsruhe will devote the bulk of its attention to plutonium and its applications,

but a certain amount of work is also to be carried out on transplutonium elements in collaboration with the Central Nuclear Measurements Bureau. These activities be aimed at the fabrication of these elements by irradiation, their separation and purification and also at studies on their physical, chemical and nuclear properties.

Pending the inauguration of the Karlsruhe Institute, work is being carried out under contract with a view to the fabrication of certain transplutonium elements in a high-flux reactor and the exploration of separation and purification techniques, while the studies now in progress on the processing of irradiated "napkin rings" are rounded off by investigations into the chemistry of transplutonium elements in aqueous solution.

Further contract work performed in collaboration with the Ispra establishment is aimed at the development of measurement and calibration techniques, the solution of various problems arising in the field of nuclear physics and exploration of the possibilities for the scientific and technical use of transuranium elements.

Furthermore, the Euratom Commission and the USAEC have sponsored a scheme of collaboration between European and American laboratories involving the coordination of the programmes undertaken and a two-way exchange of personnel.

D. *Neutron Measurements—Activities of the Central Nuclear Measurements Bureau*

49. Pending the putting into operation of its accelerators, the Central Nuclear Measurements Bureau has embarked on research and measurements in the neutron field. In this way, a high-precision measurement of the thermal neutron absorption cross-section of boron was effected in collaboration with the Belgian Nuclear Research Centre (CEN), while a further large-scale undertaking resulted in the elaboration of a highly accurate technique for measuring the fission cross-section of Pu^{239} for thermal and epithermal neutrons.

Studies on europium-doped lithium iodide crystals are being carried out in conjunction with the solid state physics laboratory

of the University of Ghent with a view to their application as neutron detectors.

The Bureau also continued its work on absolute neutron source intensity measurements (Ra-α-Be).

The apparatus required for the initial neutron measurements with the Van de Graaff accelerator have been set up and a certain number of tests carried out. A critical compendium of the available data on the reactors to be studied was compiled.

Stable or Long-life Isotopes

50. The C.N.M.B. is grappling with the difficult problem ot measuring mass discrimination in mass spectrometers in an attempt to establish primary standards for stable and fissile isotopes. At the moment, the laboratory is concentrating on studies of boron and uranium, but the progamme will be extended to include plutonium as well.

In addition to the large number of analyses carried out for outside laboratories, the laboratory has also conducted an isotopic analysis of fission foils used for the precision measurement of the thermal neutron fission cross-section fo U^{235}.

Absolute Counting of Radioisotopes

51. The advances which have been made with the development of radioisotope counting methods have recently led to very high levels of accuracy. The degree of care used in the preparation of samples has therefore had to be stepped up and errors systematically eliminated. With this aim in view, the Bureau has brought about certain improvements in the liquid scintillator method. International comparisons arranged by the International Bureau of Weights and Measures have borne out the significance of these results.

As regards other works on measuring methods, special attention was devoted to low energies, with particular reference to the development of the gas-counting technique, for which several devices are now under construction.

The CNMB is also preparing the distribution of Co^{60} standards necessary for the calibration of counting chains used for in-pile thermal neutron integrated flux measurements. This project is being conducted in close collaboration with the dosimetry working group.

The CNMB is also responsible for establishing ties with various international bodies and several standards' bureaux within the Community.

European-American Nuclear Data Committee (EANDC)

52. The collaboration ensured by this Committee with the other western countries has continued to bear fruit.

In addition to its traditional activities relating to the coordination of neutron cross-section measurements, the Committee has displayed a special interest in problems of calibration and the production of absolute standards for stable and fissile isotopes.

A large measure of coordination of neutron constant measurements within the Community was facilitated by the preparatory work conducted by a Committee of Experts from the six member countries.

The CNMB was able to publish at very short notice the minutes of a conference organized by the EANDC in July 1961 on neutron measurements by the time-of-flight technique.

International Bureau of Weights and Measures (IBWM)

53. The CNMB is continuing to work together with the Consultative Committee on Ionizing Radiations and its various working groups. It is also participating in international comparisons of radioisotope samples organized by the IBWM.

Reactor Neutron Dosimetry

54. The CNMB organized meetings of the dosimetry working group which is engaged on neutron spectra studies and in-pile integrated flux measurements, particularly in high-flux reactors.

E. *Controlled Thermonuclear Reactions*

55. In order for controlled thermonuclear fusion to be practically feasible, it must be possible to create a deuterium-tritium plasma at very high temperatures (100 million degrees or more) with a density of 10^{15} - 10^{16} ions/cm^3 and a half-life of several tenths of a second. Should it prove possible, however, to attain appreciably higher densities, it would be entirely practicable to work with plasmas having much shorter half-lives.

One of the major stumbling-blocks which science has to overcome is the question of plasma containment. The current view is that the most effective method, if not the only possible, is that using magnetic fields of suitable configuration. Such fields can be set up by currents circulating mainly in the plasma or in solid conductors.

Present knowledge of the phenomena occurring inside a plasma is still highly inadequate, for which reason special weight must be attached to basic research. The work now in progress is, in particular, providing a clearer insight into the mechanism and nature of the phenomena of diffusion across a magnetic field, the interactions between a plasma and particle beams and the propagation of all types of waves.

In these various fields, the Commission's activities are being pursued by means of association with the main laboratories of the Community in accordance with the lines mapped out in the last General Report.

While no new contracts have been added to those covered in the previous General Report, contacts have been established with a view to linking up the Community's activities in this field with the work being carried out by the Institut für Plasmaphysik at Jülich and the FOM at Juutphaas in the Netherlands. In the first case, our partners decided to postpone signing the contract for one year, while a contract with the Dutch establishment is at present in the final stage of negotiation.

For purposes of research coordination and to bring about more effective cooperation between the various laboratories

concerned, the Commission is canvassing the possibility of setting up a Consultative Committee on Fusion whose task it would be to improve contacts between the research workers of different groups and thus to dovetail the various programmes.

Valuable results were obtained under the various contracts of association during 1961, the salient points of which are:

E.1. *Euratom/CEA Association*

56. *Theoretical Research:* The Research on magneto-hydrostatic stability, already discussed in the previous General Report, was extended to cover features of a more general nature than axial symmetry; in addition, an attempt has been made to amplify this work to cover the dynamics aspect.

Valuable results were obtained in spectroscopy and in the study of microscopic electric fields in plasmas. Research is now being carried out in the field of radiation theory.

The experimental programme is still centred on magnetic mirror devices.

57. *Injection and Capture of Plasmas:* Work was continued on the preparation of DECA devices (adiabatic compression mirror machine), while an initial test series has been started with titanium guns.

In the development of plasma guns, numerous improvements were carried out on induction guns and reproducible results obtained.

Work was continued on the design of a plasma gun having a good energy balance (MICROPINCH).

58. *Continuous Mirror Device:* The main coils and the supply leads were finally installed, together with numerous components.

59. *Other Tests:* Experiments on the use of the TA-2000 torns (medium-size stabilized toroidal discharge apparatus) were continued for purposes of diagnosis and the verification of stability theories.

In addition, an assembly built for the production of tubular pinch effects, having already been widely used, has been found to possess good stability and a magnetic configuration corresponding to the theoretical predictions.

The BALLON magnetic compression experiment was completed and an experiment on the electrostatic capture of particles revealed the possibility of triggering off discharges at very low pressure.

E.2. *Euratom/CNEN Association*

60. In the field of fast compression, work is virtually finished on the setting up of the CHARYBDIS test (medium-scale device for the study of orthogonal pinch). The first results were obtained with about one third of the final condenser bank.

A study has been made of the effect produced on the triggering off of the discharge by electrostatic field shielding.

Furthermore, tests are now being conducted aimed at the production of a fine column of high density plasma by implosion of a fine layer and the setting up of very intense magnetic fields enabling plasmas to be confined by compression of pre-existent magnetic fields.

The theoretical research is devoted to shock waves and various other subjects related to the experimental work.

E.3. *Euratom's Association with the Institut für Plasmaphysik*

61. Theoretical Research: While continuing with the research undertaken by the Max Planck Institut, the theoretical section of the Joint Group also carried out numerical calculations of pinch and thetapinch in collaboration with British and American laboratories and others. Analytical studies led to the generalization of the results previously obtained concerning the stability of toroidal configurations.

Research was also continued on the interactions between a modulated ion beam and a plasma with particular reference to energy exchange.

The theoretical section has worked together with the experimental section, especially on matters dealing with the interactions between microwaves and non-homogeneous plasma, the equilibrium and thermal conductivity of dense plasmas and electronic problems.

62. *Experimental Work:* The experimental section carried out studies of oscillations, stability and shockwaves in tubular and linear pinch.

Two thetapinch devices were used to study the influence of the trapped field, which can be modified by means of various methods of pre-ionization. A larger apparatus from which a greater stability can be anticipated, is now in the process of construction.

Diffusion perpendicular to the magnetic field and the plasma oscillations were studied on a stationary plasma in a magnetic mirror configuration. Improved versions of the device are now being built.

Experiments are now being conducted to study the interactions between an ion beam and a plasma. The work was continued on the production of dense plasmas by means of arcs.

F. *Biology*

63. The Commission's general biology programme, approved by the Scientific and Technical Committee in May 1961, embodies a plan for research and coordination in all fields of biology directly related to atomic energy. The work will be focussed on various selected subjects in which marked progress is likely to be made in the course of the next few years.

A large part of the programme is to be carried out in association with existing national institutions. However, a certain amount of the work, mainly that bound up with the requirements of the Community's nuclear research centres or likely to benefit from being carried out in them, will be entrusted to the Joint Research Centre.

The uses to which nuclear technology can be put in the medical and agricultural sphere will stand high on the list of priorities, although during the next few years the main stress will be laid on studies into the effects of radiations on living organisms and the training of qualified workers, who will be encouraged to remain in Europe.

64. With regard to the effects of radiations on living organisms, the programme provides not only for long-term studies but also for research work covering bone marrow grafting or decontamination by chelate-formers for investigations of this nature might well supply rapid and empirical solutions to problems connected with health and safety and the treatment of irradiated persons. A constant objective of these studies will be to obtain as much data as possible on human radiobiology.

65. The Commission takes the view that the same number of research personnel will be required in the field of radiobiology as in general molecular biology. A large number of research workers must therefore receive a thorough grounding in a range of interlocking subjects, while the research itself must be organized in such a way as to correspond to this necessary overlapping of specialities.

The Commission's chief contribution in this field will be to promote the creation of a network of research institutes, one of which, specializing in a particular field of basic biology, would be located in each of the Community countries.

In 1961, Euratom's scientific staff engaged in biological research was increased from seven to 25. Hitherto, recruitment had been tailored to fit a policy of training only a small nucleus of high-quality research workers. Recruitment on this basis was simple enough, but the reserve of qualified candidates has by no means been exhausted. On the contrary, there is every indication that the very existence of the Community, taken in conjunction with the activities and programmes undertaken by the Commission, can play a considerable part in stemming the flow of first-

rate workers to the US, a development which has had a baneful effect on the biological sciences in the Community for some years now.

Radiobiology

66. At present, the Biology Department of the Joint Centre is restricted to four sections: toxicology, dosimetry, cell culture and ecology. The staff is now being recruited and will gradually be built up during 1962.

Pending the provision of full equipment for these teams, the Commission's activities have been carried on under contracts.

Since 1 December 1959, a contract of association has been in force between the Commission and the Nederlandsche Centrale Organisatie voor Toegepaste Natuurwetenschappelijk Onderzoek (TNO) for experimental studies linked with the treatment of radiation sickness and the breeding of specific-pathogen-free animals. The Commission's backing has made it possible to carry out this intricate and highly useful work on a very large scale.

A contract with the Paris Radium Institute's Pasteur Laboratory is concerned with investigations into the effect of radiation on deoxyribonucleic acid, the substance which constitutes the material vehicle of heredity and which plays a vital role in the process of growth, whether normal or pathological. Studies on the effect of radiation on the structure of this substance are therefore of fundamental importance, and the speed and scope of this research has been appreciably stepped up due to Euratom's participation.

A contract with the Free University of Brussels constitutes the first link in a system of associations aimed at the maintenance within the Community, under the aegis of the Commission, of a network of basic biology laboratories in which young research workers can receive their fundamental training. Negotiations are in progress with the Naples Institute of Biophysics with a view to forging the second link in this chain.

Studies on substances capable of affording radiological protection are being conducted by the University of Liège.

The Commission has concluded a contract with the Institut Carnoy at the Catholic University of Louvain for studies into methods of irradiating specific chromosome segments and an investigation of the morphological, biochemical and genetic effects.

Other contracts now in the drafting stage will cover various fields of radiobiology, such as the effects of radiation on proteins, permeability phenomena, tissue regeneration, cancer induction, etc.

67. The Commission is exploring the possibility of setting up a radiobiological clinic in association with a large medical school for studying the effects of radiation on the human organism and their treatment. Patients suffering from haematological disorders (radiogenic, etc.) would be able to receive appropriate attention, while at the same time the experience gained from their treatment would be instrumental in enlarging our knowledge in this vital and very inadequately explored field.

68. Studies on the influence of radioactivity on the environment presuppose the most thorough possible knowledge of the various components of the medium, and in this context the putting into operation of the Ispra establishment is bringing the Commission up against certain problems which will form the focal point of the programme of the Joint Centre's ecology department. In addition, a contract was concluded with the Pallanza Institute of Hydrobiology for carrying out ecological studies on the fish in Lake Maggiore in an attempt to make forecasts with regard to radioactivity effects.

With the same aim in view, negotiations now in progress with the French Atomic Energy Commission (CEA) and the Italian Atomic Energy Commission (CNEN) are directed at setting up a coordinated programme for studying the interactions between radioelements and marine organisms and their consequences with regard to radioactive contamination and biological equilibrium of the sea.

Research workers seconded to specialized laboratories by the Commission have commenced studies on the activation analysis of strontium in plants, intrasomatic selection in irradiated corn, the biometric evaluation of radio-induced variability in plants and the embryogenesis of vegetables irradiated at various stages of their ontogenic development. Several publications on the subject have already gone to press.

Medical Applications of Nuclear Techniques

69. Negotiations now in progress with several major Community groups in the clinical field are aimed at deriving greater advantage from the wide range of possibilities offered by nuclear energy in order to improve human diagnosis and therapy. Rather than fostering the use of conventional methods, the Commission will lend its support to research work directed at improving existing methods and above all at the development of novel methods of diagnosis and treatment.

Application of Nuclear Techniques to Agronomy

70. The association with the Instituut voor Toepassing van Atoomenergie in de Landbouw (ITAL), drawn up on 25 April 1961, entered a productive phase with the completion of its new laboratories. Work has been begun on the construction of a research reactor and the present rate of progress indicates that it will be ready by mid-1963. Several sub-contracts are now being negotiated which are closely related to the programme of the association. Research workers seconded to the ITAL by the Commission have continued to introduce refinements in the autoradiographical methods required for studies on the translocation of radioactive substances in plants and have begun to tackle the strontium-calcium problem in soil-plant inter-relations.

At the end of 1961, the Commission drew up a further contract with the Institut national de la Recherche agronomique (INRA) at Versailles for comparing the effects of various mutagens by means of mutagenesis studies in various type-plants.

Negotiations are now under way with the Institut national agronomique (IAN) in Paris and the French Atomic Energy Commission (CEA) for the drafting of a programme devoted primarily to a comparison of the effects of chemical as opposed to physical mutagens.

G. *Production and Use of Radioisotopes and Marked Molecules*

71. The Community's radioisotope requirements show a constant upgrade. While maintaining its contacts with existing manufacturers and with those reactor centres which cater for radioisotope fabrication, and endeavouring to promote the expansion of production and to foster a coordinated programme, the Commission does not for the time being contemplate taking a direct part in isotope manufacture.

In connection with the Joint Centre's research programme and in compliance with the recommendations put forward by the ad hoc "reprocessing" group of the Consultative Committee for Nuclear Research, several research contracts on the separation of useful fission products are now in the process of negotiation.

The Commission's plan to set up a stock of rare marked molecules, mentioned in the previous General Report, has been welcomed throughout the Community. Numerous non-commercial producers have offered their services and an inventory of more than 100 available products has been compiled. A total of 10 contracts have been concluded with leading university laboratories, and 30 more are in prospect for the near future. By means of these contracts, users will be provided with new marked compounds consisting, in particular, of hormones, amino-acids, proteins and intermediate products involved in the synthesis of organic substances. Research contracts are also aimed at improving present preparation, purification and storage methods as well as the development of novel techniques. The current negotiations offer the prospect of a considerable expansion of this programme in the course of 1962 at no major expense.

Further contracts, now in the process of drafting, will be concluded with several laboratories for the amplification of basic

research aimed at opening up fresh possibilities for the practical utilization of radioisotopes.

Discussions conducted by the working group on irradiation capsules will be of great benefit in connection with irradiation work relating to this field.

H. *Computer Centre and Scientific Data Processing Centre*

72. The year 1961 saw the gradual build-up of the European Scientific Data Processing Centre (CETIS) at Ispra, and the last team still working in Brussels moved to Ispra in December.

The first machine—an IBM 1620—went into service in January 1961. This was followed in July by the putting into operation of a PACE 231 R analogue computer and IBM 7090 and IBM 1401 ordinators. Additional equipment (supplementary memory units) were delivered at the beginning of 1962. After the completion of trials, these machines were put to steadily increasing use, which by the end of the year was only restricted due to the lack of qualified staff.

With a running time of 9½ hours per working day, the usage of IBM ordinators was fixed at 755 hours for the period September through December 1961. The effective usage during the same period was 612.5 hours for the IBM 7090, 422.9 hours for the IBM 1401 and 788.2 hours for the IBM 1620.

Calculations were carried out for Euratom and various outside clients. In addition, Community institutions such as the Common Market and the European Investment Bank are planning to give CETIS large orders, so that during the coming period the IBM 7090 is to be put on two-shift and the IBM 1401 possibly three-shift operation.

Discussions conducted by the high-level committee of experts of the European Nuclear Energy Agency resulted in the compilation and submission to the Agency of a plan for a European Nuclear code programme library.

Furthermore, a study was made of a programme for the mechanisation of administrative processes for various Euratom departments, such as stores, accounting and personnel.

In addition to the above, the research embodied in the original CETIS programme was extended to cover immediate experimentation and short-term practical results. Personnel and budgetary considerations demand that long-term research projects, some of which are being carried out under contract, be limited or staggered to a certain extent. The main results obtained in 1961 are described below.

Automatic Translation

73. The system of grammatical analysis developed by CETIS and known as the "méthode des conflits" (conflict method) was programmed and tested on the IBM 7090 ordinator. An automatic English-German dictionary was developed and tested on the IBM 1401. Finally, CETIS has carried out tests with an extensive automatic translation programme evolved by Georgetown University, Washington, and has started to feed it into the IBM 7090. The assistance afforded by the American experts gives reason to believe that Russian-English translation facilities will be available to Community users by the end of the first half of 1962.

Automatic Documentation

74. An automatic documentation programme was developed on the basis of the key-word method and preparations are being made for the automatic analysis of documents in the field of atomic energy. An effort is also being made to devise processes for the conversion of the various codes used for analyses obtained from different sources so that all these analyses can be processed with the IBM 7090 and IBM 1401 ordinators.

Mathematics

75. The mathematical research section has been engaged on the solution of problems raised by other CETIS teams. Using the Boole algebra method and the graph theory, it has, for example, solved the problem of minimizing the number of amplifiers in an analog system.

Statistical programme methods have been developed for use in documentary reference work, while mathematical logic has been applied to clear up certain semantic problems in natural languages.

Finally, work was recently begun on the development of what may prove to be a new branch of applied mathematics; this new field, known as limitative analysis, forms a link between numerical analysis, the theory of automatic machines and information theory. The progress achieved in this field seems to provide concrete substantiation of the hypothesis postulating the fundamental unity of numerical and non-numerical information, on which the structure of CETIS is based.

I. Other Research

Nuclear Physics

a) *Studies Carried out at the Joint Centre*

76. The experimental neutron section has designed an experimental device which can be used to generate an intense polarized thermal neutron beam.

The apparatus will be used for a lengthy series of experiments for studying the electromagnetic transitions produced in nuclei by neutron capture and for investigating other types of nuclear interactions.

After an initial stage devoted to the study of physical and technical questions relating to the polarization method and the research programme, the technical project was commenced and the equipment ordered progressively as the various designs were completed. It should be noted that the greater part of the equipment is made on the spot at the Ispra centre.

Installation work on one of the channels of the Ispra I reactor will be finished by the end of April 1962. Testing will

go on until August, so that experimental work can start up in September.

The nuclear chemistry department has set about an investigation of the Be-7 (n, α) He-4 reaction. These tests were carried out with the use of targets placed in the Ispra I reactor. A new measurement cycle will be begun at the end of February with the aid of an improved electronic system developed at Ispra.

b) *Contract Studies*

77. The fourth General Report referred to the conclusion at the end of 1960 of a contract of association with the Italian Atomic Energy Commission (CNEN), the execution of which is in the hands of the Italian laboratories affiliated to the Istituto Nazionale di Fisica Nucleare.

Work on this contract of association was begun in earnest in 1961.

At Catania, Florence, Milan, Trieste and Turin the bulk of the research effort is concentrated on the measurement of a series of nuclear reactions of various elements, for which the necessary apparatus and techniques have been developed.

The Bologna and Padua groups are engaged on internal bremsstrahlung studies. The validity of the hypotheses advanced on the interactions governing beta activity was examined. Here too, a large part of the work was devoted to the development of equipment and methods.

The work done at Genoa bore mainly on the development of a 31 MeV betatron with stepped-up performance and improved measuring instrumentation. The research proper is directed towards studies into photonuclear reactions.

The bulk of the activities carried out at Naples are concerned with nuclear spectroscopy.

Finally, the Palermo group, the work of which has been subjected to certain delays, is engaged on the construction af a pile oscillator to be used in the AGN-201 reactor.

Mineralogy and Geochemistry

78. Although its laboratories are not yet completed, the mineralogy-geochemistry section at the Ispra Centre is carrying out intensive studies on carbonatites. This choice was dictated by the almost total lack of information on the basic geochemistry and radioactivity of these rocks and by the prospect of discovering new source materials for various elements.

The programme also opens up the possibility of combining basic and applied research and of evolving original methods of investigation with regard both to field and laboratory work.

Field surveys carried out on alkaline and carbonatite rocks in the Kaiserstuhl area yielded, within the space of a few months, some noteworthy results, despite the fact that this region had already undergone fairly thorough exploration.

— From the geological standpoint, the thickness of the tectonic layers was determined in the central part of the Kaiserstuhl with a view to investigating its genesis and mineralization.

— From the geophysical angle, magnetic measurements in the carbonatite zone pointed to the presence of fairly extensive anomalies, corresponding to large magnetite deposits.

— The geochemical examination of the carbonatite zone for niobium detection revealed several fairly large anomalies, indicating an Nb_2O_5 content of over 0.30% in the carbonatites.

79. This preliminary work will be rounded off in 1962 by laboratory studies on the basis of which it will be possible to assemble a considerable body of geochemical data.

Geochemical calculations, X-ray studies, and the fabrication of standard mineralogical samples have been the central theme of the Ispra Centre's activities, while the fitting-out of the laboratories is planned for 1962.

A contract was signed in July 1961 with a Dutch firm bearing on the chemical analysis of rock and mineral samples to

be used as standards for the projected geochemical studies at Ispra.

Isotope Geology

80. The Commission had decided as early as 1960 to undertake studies into the application of nuclear physics to geological and geochemical problems, which are of major theoretical and practical importance.

Research in this field requires special and relatively expensive equipment and must be carried out by research teams covering a wide variety of scientific disciplines. In the Commission's view, the most effective way of tackling this necessarily long-term project was to resort to the policy adopted in many other fields of entering into associations with certain Community laboratories.

In 1961 an extensive contract of association was drawn up with the Italian Atomic Energy Commission (CNEN) and the Free University of Brussels (representing also the "Institut interuniversitaire des Sciences nucléaires de Belgique"), providing for the use of radioactive methods for determining geological age and studies into isotopes distribution in Antarctic snow and ice samples taken in 1960 by a Belgo-Italian expedition.

A second research contract with the Bundesanstalt für Bodenforschung in Hanover is concerned with the determination of geological age, the work being mainly carried out on magma rocks and tertiary minerals from West Germany and the eastern Alps. The main stress is to be laid on comparison of the results by using the various dating methods on the same minerals.

The results of the studies carried out under the geological research contracts hitherto include the first absolute age determinations of the Hoggar granite rocks.

The rapid increase in technical facilities and scientific progress due to the Commission's assistance indicates that these measures have proved to be both timely and effective.

Direct Conversion

81. The direct conversion section at Ispra has embarked on the development of techniques for the direct (obviating the use of turbines and generators) conversion of heat into electricity, taking as a point of departure the fact that the heat is generated by nuclear reactions.

Thermionic Converter

82. The most promising approach to the problem from the viewpoint of technical practicability is at the moment based on electron and ion emission from the very hot surface of a nuclear fuel rod.

The ground is being prepared for experiments to determine the emission properties of pure substances and compounds which contain fissile material or which can be used as cladding.

Tests are also in preparation for the examination in a high-flux reactor of the corrosion behaviour of various materials used in the fabrication of converter cells.

As concerns research into the physical properties, design studies are now in progress on cells in which the nuclear heat source will be replaced by electron bombardment or electrical heating.

Magnetohydrodynamic Generator (MHD)

83. Another feasible method of direct conversion consists in separating the electrons from the positive ions of a weakly-ionized gas emitted from a nuclear reactor at high velocity.

Theoretical studies were therefore carried out to investigate the possibility of producing a gas with adequate conductivity properties inside the MHD generator.

Effluent Processing

84. Part of this research, the bulk of which is being carried out under contract, relates to special studies connected with the topo-

graphical features of the Ispra establishment. By means of a systematic site survey, they are to provide the basis for assessing the possibility of storing or disposing of radioactive effluents while at the same time ensuring the greatest possible degree of safety.

A preliminary hydrogeological survey of the Ispra site has shown that due to the danger of groundwater contamination effluents cannot be released in the surface area. Exploration must therefore be continued to determine whether they can be discharged in lower strata.

A lengthy series of electrical soundings was carried out in the course of a geophysical survey to determine the depth of the substratum.

This survey is to be rounded off by seismic studies.

Finally, a hydrodynamic examination of Lake Maggiore was initiated. Detailed bathymetric readings were taken for the southern part of the lake, and the currents at various depths systematically examined. Tests at greater depths are still in progress.

Other tests are planned with a view to the further improvement of effluent purification, especial attention being paid to the use of selective inorganic ion exchangers for strontium and caesium.

An investigation is being carried out under the Euratom/US Joint Programme concerned with the volume reduction of low-activity waste by incineration, its containment in bituminous materials and its permanent storage in a suitable location below ground.

A new type of incinerator has been built and tests are now being conducted to determine the most favourable conditions for the decontamination of exhaust gases and the obtaining of ash which can be easily contained in bitumen.

The process for the containment of these ashes and the sludge left over from the decantation of low activity waste is now being developed on pilot scale, with highly encouraging results both from the economy and the safety standpoint. Bitumen

samples containing active material exposed to very high irradiation doses and then subjected to elution tests in acid, neutral and base aqueous media showed a very low elution rate.

Finally, work is being carried on to devise methods of examining the highly complex phenomenon embracing the movements of subterranean waters and the fixation properties of various types of soil for individual isotopes. Participation by research workers from the USAEC and the Weizmann Institute, Israel, in the work carried out at Mol has resulted in close collaboration with these two establishments.

IV. Training

A. *Euratom Training Facilities*

Student Trainees

85. The year 1961 saw the continuation in the Community's research centres of the student training schemes first announced in March 1960, while further openings have been made available by various public and private research establishments. The Commission, formerly compelled to assign students to the temporary headquarters of the Scientific Data Processing Centre in Brussels, is now for the first time able to accommodate them at Ispra and Geel.

In an effort to ensure the smooth running of the work programme and to help the trainees to fit in better with the teams to which they are assigned, the minimum length of the training courses was raised from one month to two and the maximum from six months to one year. Applications from trained engineers and technicians were also considered for the first time in 1961, but they will remain limited in number. In about 70 % of cases, the quality of the work carried out by students attending the courses was assessed as above-average by the scientists of the host organization as a result of which the

Commission was able to pay the trainees a further grant in addition to the flat-rate allowance.

The following table provides an overall picture of the training schemes carried out in 1961:

Number of actual applications (after 21 withdrawals)	483 = 100 %
Candidates accepted by Community research centres (including Ispra and Geel)	288 = 60 %
Applications rejected through lack of space or inadequate qualifications	77 = 16 %
Applications held over for future courses	118 = 24 %

The number of applications accepted therefore underwent a sharp increase (60 % as opposed to 45 % in 1960), while an even more marked drop occurred in the rejections (16 % as opposed to 45 % in 1960).

The scheme will be amplified in 1962.

"Qualified Trainee" Schemes

86. Apart from the training schemes for students, the Joint Research Centre and the research and association contracts drawn up by the Commission also offer numerous opportunities for advanced training to scientists and engineers who are already qualified and have acquired a certain amount of practical experience in their respective fields. It was with such people in mind that the "qualified trainee" scheme was launched by the Commission in 1961. These courses usually last for periods ranging from two to twelve months, but can be extended in line with requirements. Persons attending such courses receive a flat-rate allowance which is determined on a case-to-case basis.

B. *Euratom Diplomas*

87. The contacts initiated with various teaching establishments have revealed the weight which they attach to the Commission's proposal to institute Community-level diplomas for engineers and technicians specializing in nuclear energy. Work was therefore continued in 1961 with a view to finalizing appropriate programmes in the fields of radiochemistry, isotope technology and

radiation protection and to the mapping out of programmes dealing with nuclear instrumentation and control and reactor technology and operation. If these programmes are accepted by the technical colleges, examinations based on standard criteria could be introduced and the diplomas granted equal recognition throughout the Community, a development which would gradually result in the standardization of the various curricula.

EUROPEAN UNIVERSITY

88. The statement on cultural cooperation issued after the Bonn conference of heads of state and government speaks of the "establishment by Italy of a European University in Florence to the academic life and financing of which the six Governments will contribute".

Acting on this, the Italian Government called a meeting of the European University Provisional Organizational Committee, which was held in Florence on 11 and 12 October. Representatives of the European Communities were invited to attend and President Hirsch personnally participated in the work of the Committee, which was presided over by Ambassador Corrias, the Italian Government representative.

In view of Article 9, para. 2, of the Euratom Treaty, which accords the European Atomic Energy Community special rights in this field, the Italian Government has always been most emphatic in its advocacy of the Communities' participation in the plan for a European University. Several resolutions concerning the nature of the working procedure to be applied for the university were adopted at this meeting.

It is to be granted international status by Italy, the form of the participation of the five other Governments to be fixed under a joint agreement between the states involved. The corresponding texts have been drafted and submitted to the Italian

authorities. They are now being examined and will be discussed at a meeting due to be held in the near future.

The delegations found that the proposals tabled by the Interim Committee concerning the curricula, the organization of studies, the recruitment of lecturers and the admission of students, together with the award of an European doctorate, should be accepted in their entirety. A working group of university professors from the six countries is now engaged on preparing the ground for implementation of these proposals.

A technical working group is also to be created to ensure that the university will be installed and equipped in line with the requirements of its scientific programmes. The Italian Government has acquired 75 acres of land at Marignolle near Florence and the construction plans have been drafted by the technical departments of the Florence municipal authorities.

The Commission has always displayed great interest in the plan for a European University. At the present state of negotiations, there is every reason to anticipate that the university will in fact be established and developed fully as planned.

CHAPTER II

DISSEMINATION OF INFORMATION

CREATION OF AN "INFORMATION AND DOCUMENTATION CENTRE" (IDC) — DEFINITION OF A DISSEMINATION OF INFORMATION POLICY — PUBLICATION OF RESULTS OF RESEARCH PROGRAMME — DEVELOPMENT OF THE BIBLIOGRAPHICAL INFORMATION SERVICE — FINALISATION OF AUTOMATIC DOCUMENTATION PROGRAMME — INCREASE IN THE NUMBER OF PATENTS ADMINISTERED BY THE COMMISSION — UNIFICATION OF INDUSTRIAL PROPERTY RIGHTS IN THE MEMBER STATES

89. The Commission had devoted previous years to studying methods and selecting principles for the policy to be adopted with regard to the dissemination of information.

In 1961, it turned its attention to more concrete aspects.

The units responsible for documentation, libraries and publications have been reorganized and, since May 1961, have formed the "Information and Documentation Centre" (IDC).

Having got beyond the preparatory stage, they are now in a position to perform actual services for the Member States and for persons and enterprises in the Community.

The Director of the Centre took up his duties in May 1961 and the heads of the various departments have been appointed. After overcoming some short-lived difficulties in the matter of recruitment, the Centre had at its disposal by the end of 1961 a staff sizeable enough for a division of labour to be applied among the various specialized departments.

It should be pointed out that the Consultative Group on Documentation, which had been set up in 1959 and had only

been able to meet on one occasion, held an important session in November 1961. This Group is composed of experts from the six Member States who have been appointed in a personal capacity on account of their knowledge of documentation and information problems.

The November 1961 session, which enabled the Group to establish an initial contact with the leading officials of the "Information and Documentation Centre" (IDC), at the same time provided the setting for a mutually profitable exchange of views on the methods and programmes adopted by the various national documentation centres. One point that emerged very clearly was the need for creating a complete documentation exchange network centred on the IDC. On the Group's recommendation, the IDC arranged a meeting, held in February 1962, with the heads of the documentation services of the national nuclear centres for a joint study of the problems bound up with the institution of a network of this kind.

The number of patents for inventions by the personnel of the Joint Research Centre and of holders of contracts has recorded a relatively fast growth.

The application of the patent rules laid down by the Commission in January 1961 has facilitated the conclusion of research contracts.

I. Documentation

A. *Libraries*

90. The library of the Ispra establishment is destined to become the largest of the Commission's scientific and technical libraries. At the end of 1961, it contained about 30,000 books, 2,000 periodicals and 30,000 reports.

The Brussels library, which is of a more general nature, hat at the end of 1961 approximately 34,000 books, 2,100

periodicals (about a thousand of which were scientific) and 51,000 reports (including 27,000 in the form of micro-cards).

Of the other JRC establishment libraries, the only one to which attention has been devoted to any great extent is that of the Central Nuclear Measurements Bureau at Geel, which now contains around 450 books, 100 periodicals and 400 reports. The organization of the libraries of the Karlsruhe and Petten establishments will not start until sometime in 1962.

The large number of libraries, the diversity in the spheres of interests displayed by the users, the need to employ existing funds to the maximum advantage and to improve mutual understanding and practical cooperation—all these factors prompted the "Information and Documentation Centre" in 1961 to engage the services of a specialist whose task it will be to coordinate the activities of the various libraries and prepare the ground for the standardization of catalogues and the creation of efficient aids to librarianship, by harmonizing the libraries' working methods, promoting a rational acquisition policy and developing good relations with the national libraries.

B. *Machine Documentation*

91. The initial activities of the Commission in the field of technical and scientific documentation were directed towards the establishment of a scheme for collaboration with the US review "Nuclear Science Abstracts", which is published by the USAEC. This review contains notices of most of the outstanding technical and scientific publications, and thus it would have served no purpose to create a parallel structure; it was better, in the interests of science, to assist "Nuclear Science Abstracts", on the widest possible scale.

However, the number of publications recorded in "Nuclear Science Abstracts" has risen so sharply over the past few years that it has become difficult to use this review in its present form as a basis for specialized documentary research. The total number of references published in it is now 30,000 to 40,000 per year. It

would thus appear advisable to set about solving the problem by "storing" this mass of information in an electronic "memory".

The "Information and Documentation Centre" has worked out a programme in which only key words and some bibliographical data sufficient to describe the desired document are fed into the memory banks.

Something like 85% or 90% of the data "stored" will be derived from "Nuclear Science Abstracts". The rest will come from other sources and will relate to patents and also to subsidiary fields in which the Commission has a certain interest. The choice of the method and equipment for the operation is based on similar processes adopted in other branches of science. A list comprising about 1,400 key words, not counting those which denote chemical compounds and isotopes, has been compiled for the purpose of codification. It is, in fact, a digest of the index of key words in "Nuclear Science Abstracts". The results of this research will be submitted in the form of complete abstracts of the documents selected.

This first step towards mechanized documentation is, compared with the European Scientific Data Processing Centre (CETIS) projects, a relatively modest but nonetheless necessary advance. The activities of CETIS, it will be remembered, are aimed at automatic documentation in the strict sense of the term.

C. *Relations with the United States and the United Kingdom (Documentation Pools)*

92. The "Information and Documentation Centre" is working together with the USAEC's information departments. The allotting of the tasks among three documentation pools has now been partially abandoned.

The Commission is assisting as much as it can in the collection of the data published in "Nuclear Science Abstracts" (this was the original purpose of the scientific and technical documentation pool). As regards information on translations, the aims of the Transatom Pool have been achieved by the publication of the

monthly review "Transatom Bulletin" (see III—Publications). The assembling of legal economic and social information as previously envisaged (pool for documentary material on the social sciences) has been postponed, since it was found that the literature already available on these subjects was perfectly adequate.

The preparations made by Euratom for the electronic storage of data relating to nuclear technology are being followed with interest by both the United States and the United Kingdom. In due course, the results of this operation will, should the occasion arise, be made available to Euratom's two partners.

D. *Bibliographical Information Service*

93. The "Information and Documentation Centre", however, will be called upon to fulfil requests arising from the implementation of the Commission's programme before the electronic memory has been put into operation.

The Commission has accordingly established a Bibliographical Information Service, which from the time it was set up in 1960 until the end of 1961 had undertaken more than 200 research operations. The results of these operations are recorded in the form of card-indexes or bibliographies. If necessary, they are accompanied by a report and in some cases by a critical analysis of the literature in question.

This service employs conventional methods; it is assisted by some twenty correspondents in member or non-member countries, who supply it with the necessary data.

The relative slowness of the traditional methods has inevitably narrowed down the scope of this unit as regards questions put by the JRC and the other departments of the Commission, in particular the Contract Office and the Patent Office. Once the electronic memory has been put into operation, i.e. according to the most optimistic forecast in 1964, it will be possible to carry out documentary research for all research institutions and all enterprises in the Community.

As, however, many of the questions put to it in connection with documentation fall outside the field of nuclear technology proper, this Bibliographical Information Service will continue to use its present methods, even when the electronic memory has become available, for the simple reason that the memory will only be fed with nuclear data, which in many cases will have to be supplemented by information of a non-nuclear character.

II. Industrial Property

1961 was marked by a fairly rapid expansion in the number of patents in the Community. The application of the patent rules laid down by the Commission in January 1961 has resulted in the insertion of new clauses in research contracts.

A. Communications of Patent Applications (Article 16)

94. Notifications of patent applications to the Commission as provided in Article 16 of the Treaty have been submitted in a regular manner. All the Governments are now submitting such notifications within the time-limits laid down in the Treaty.

Between the date of the Treaty's coming into force and 31 December 1961, the Commission received details of 7,443 patent applications, 3,213 of which were notified in 1961. The total number of inventions covered by these patent applications is 5,569.

B. *Filing of Patents by the Community and Holders of its Contracts*

95. At the beginning of 1962, the Commission's Patent Office had dealt with 131 inventions stemming from the research programme.

At the same date, 89 of these inventions had been the subject of a first patent application in a Community country or in the United Kingdom (patents arising out of the DRAGON Project).

Furthermore 30 of these first applications had given rise to a request for the extension of the patent rights to countries other than that in which the first application had been filed.

It is satisfying to record that the ECO, ESSOR and ORGEL operations have yielded 20 inventions, all by Commission employees. Contracts relating to the same projects have produced 11 patents, which have been registered by the contract-holders and in respect of which the Commission has a licence and also the right to grant sub-licences under certain conditions.

The Commission also administers a dozen or so patents deriving from work on controlled thermonuclear fusion. Some of these patents are of a fundamental character but the majority relate to auxiliary devices.

Within the framework of the Euratom/CEN association for the joint operation of the BR2 reactor, 21 inventions have been examined, 16 patents have been taken out in the name of the Community and one in the name of the CEN.

In line with the terms of the DRAGON Agreement, the UKAEA files patents in the United Kingdom and in non-member countries not signatories to the Agreement. The Commission has the right to register corresponding patents in the name of the Community in Member States, which it has done in the case of 25 inventions arising out of the DRAGON Project. In respect of these patents, the Community holds a licence on behalf of the Member States, individuals and firms. It is not obliged to grant licences within the Community to firms not belonging to the Community, even where such firms are established in countries which are signatories to the DRAGON Agreement.

The majority of patents are confined to a few reactors or reactor projects and in the fairly near future may open up attractive prospects.

The number of patents in the field of nuclear fusion is by no means negligible but it will be some time before they can be exploited industrially. In this sphere, it is only a question of securing a favourable position for future developments.

C. *Patent Policy*

96. In January 1961, the Commission defined for the Council the guiding principles of the patent system it proposed to adopt in research contracts concluded under Article 10 of the Treaty.

These principles were set out in detail in the Community's 4th General Report and it is sufficient here to recapitulate the most important points, namely:

1. The contract-holder can own the patents if he so desires;
2. The Community is entitled to a royalty-free licence for the purpose of meeting Commission requirements;
3. The Commission may grant sub-licences insofar as this does not clash with the terms of the Treaty and provided that fundamental and procedural conditions are offered giving the contracting party the necessary guarantees.

This new system has had an unquestionably favourable influence on the negotiation of research contracts, at the same time facilitating the relations between the Commission and contracting parties.

The problem of "basic" patents belonging to contract-holders has been discussed with the governmental experts but no overall solution has yet been devised.

The same applies to the contract-holder's know-how, for which it will not be possible to work out a satisfactory procedure until the general policy has been fixed to govern the dissemination of information resulting from the research programme.

The patent system applicable to contracts under the US-Euratom Joint Research and Development Programme has not been modified to any significant extent. In the case of countries other than the United States, however, the Commission has waived ownership of the patents in favour of holders of its contracts, at the same time maintaining intact the licence rights of the Community and the USAEC as provided by the Cooperation Agreement.

It is to be hoped that in the course of 1962 an exclusive licence for non-nuclear applications will be able to be granted to contract-holders, if the amendment on this point, which the Commission and the USAEC have proposed should be made to the Cooperation Agreement, is adopted by Congress.

D. *Standardization of Industrial Property Rights Within the Community*

97. Both the Euratom and the EEC Commission have participated in the work undertaken by the six Community countries with a view to the establishment of new European industrial property rights.

This work, which was started in November 1959, is being carried out rapidly and smoothly.

In particular, the working group responsible for the drafting of a European patent convention held four sessions of a fortnight each in the course of a year and will probably complete its task in 1962.

III. Publication

A. *Diffusion of Information Derived from the Community's Research Programme*

98. Since 1958, the Commission had gradually been setting up the essential machinery for enabling research workers and technicians to form as accurate and as comprehensive an idea as possible of the latest advances in nuclear technology. It was now called upon to define, in the light of all the various aspects of the problem, the principles according to which its own contribution in this field should be publicized.

Thus in February 1962, it initiated discussions with the competent organs of the Council on the general problem of Commu-

nity policy regarding the dissemination of information yielded by the research programme and the exchange of such information with certain non-member countries.

The Commission has a duty to promote as much as possible the publication of information having a humanitarian slant, such as that emerging from the fields of medicine and biology, as well as basic scientific data.

Industrial information, on the other hand, can only be published in cases where premature publication does not risk depriving the Community's nuclear industries of the advantage of priority of use. For this reason, the Commission will have to develop procedures for the communication to Member States and individuals and firms in the Community of unpublished information, in accordance with Article 13 of the Treaty.

B. *Scientific and Technical Publications*

99. The Transatom Bulletin has continued to appear regularly. Two new reviews have been launched, namely the Quarterly Digest, which publishes the results of the US-Euratom Joint Research and Development Programme, and the Euratom Bulletin, which is aimed at giving the general public a progress report in everyday language on the Commission's research programme and other activities.

1. *Quarterly Digest*

In order to give those interested a succinct idea of the contents of the reports drawn up by holders of contracts with Euratom and the USAEC under the Joint Research and Development Programme, the Commission has been publishing each quarter since 1961 a review containing brief surveys. The full contents of this periodical, which is called "The Joint Research and Development Quarterly Digest", are:

a) a list of new contracts awarded by the Commission and the USAEC;

b) an outline of the object of each contract;

c) bibliographical references and summaries of quarterly, special and final reports drawn up by the contracting parties.

The Quarterly Digest is designed merely to serve for reference purposes.

The documents referred to in the Quarterly Digest are available in the form of printed matter (final reports) and microfilms (quarterly reports).

2. *Transatom Bulletin*

As far back as 1959, the USAEC and the UKAEA had been sounded out with a view to setting up a scheme for close cooperation in the field of documentation, an arrangement which soon yielded results as regards information on translations. At the end of 1960, the Commission started publishing a monthly bulletin containing information on translations either existing or in preparation, of scientific or technical documents from Slavonic or oriental languages and on ways of procuring them.

The Transatom Bulletin met with a favourable reception and its circulation rose considerably during 1961.

The bibliographical references published in it are taken from numerous sources, the chief of which are the United States (49%), France (13%), Germany (12%), United Kingdom (6%), Austria (2%) and Canada (1,5%). The number of references published as at 31 December 1961 was 6,200.

3. *Non-Periodical Publications*

A list has been compiled of non-periodical works published as of 31 December 1961.

This list comprises 182 titles, consisting of 68 papers delivered at conferences, discussions, etc., 72 articles which have been or are to be published in reviews and 42 documents put out by the Commission.

4. *Euratom Bulletin*

The publications referred to above will provide specialists with detailed information on the results of the research programme.

The Commission felt that it should also make such information available to a wider public than that of experts in a particular scientific discipline.

Accordingly, it made preparations in 1961 for the publication of a periodical of the popular science type, the first issue of which came from the press in February 1962.

All those who are interested in the peaceful uses of nuclear energy, but who have not sufficient time to study highly specialized documents will find in the Euratom Bulletin condensed information on particular scientific or technical problems, and also on the solutions which have been devised in the course of the Community's activities.

NOTES

Annexed to this report is a list of scientific and technical publications, and also a list of patents arising out of the research programme, both of which may be usefully consulted.

Additional information on the publications mentioned in the foregoing chapter (subscription rates, conditions of sale of reports and microfilms, etc.) may be obtained from :

Euratom, Directorate for Dissemination of Information "Information and Documentation Centre" (IDC) 51, rue Belliard, Brussels.

CHAPTER III

INDUSTRY AND ECONOMY

NUCLEAR INDUSTRY TODAY — OUTLOOK FOR COMPETITION — CURRENT POWER REACTOR PROGRAMMES — IMPLEMENTATION OF UNITED STATES/EURATOM AGREEMENT — EURATOM'S DRIVE TO PROMOTE POWER-REACTOR CONSTRUCTION — FREE TRAFFIC IN NUCLEAR PRODUCTS — FREE ACCESS TO SPECIALIZED JOBS — SUPPLEMENTARY CONVENTION ON THIRD-PARTY LIABILITY AND NUCLEAR INSURANCE — DEVELOPMENT OF FUEL ELEMENTS — DEVELOPMENT OF NUCLEAR PROPULSION UNITS FOR MERCHANT SHIPPING — INDUSTRIAL AND TECHNOLOGICAL USES OF RADIO-ISOTOPES AND RADIATIONS — TRANSACTIONS, PRICES, PROCEDURES AND PROSPECTS IN THE FIELD OF ORE, NATURAL URANIUM AND SPECIAL FISSILE MATERIAL SUPPLIES — THE SUPPLY AGENCY AND ITS CONSULTATIVE COMMITTEE — REPROCESSING AND TRANSPORTATION OF IRRADIATED FUELS — BROADENED RELATIONS WITH INDUSTRIAL ASSOCIATIONS AND TRADE UNIONS

I. Nuclear Energy Today
Outlook for Competition

A. *Nuclear Power Plants*

100. For 1961, the nuclear electricity output in the Community amounted to 270 million kWh. While this figure represents less than 0.001 of the total power produced, i.e. 285,000 million kWh, it is important to note the following trend since 1957 (in millions of kWh):

1957	1958	1959	1960	1961
1	4	41	130	270

The same holds good for installed nuclear capacity, which at 31 December 1961 was 73 MWe (58 in France and 15 in Ger-

many), and which, according to estimates, will have risen to 151 MWe by the end of 1962, to 714 MWe by the end of 1963 and to more than 1600 MWe by the end of 1966.

The commissioning schedule currently envisaged by electricity producers over the next few year is as follows:

— 1962: 78 MWe (10 in Belgium and 68 in France)

— 1963: 563 MWe (15 in Germany, 198 in France and 350 in Italy)

— 1964-1966: about 950 MWe (740 in France, 165 in Italy and 50 in Germany).

By the end of 1966 nuclear electricity output may be expected to have attained an annual figure of 8,000 to 10,000 million kWh, or about 2% of the estimated total electricity production as compared with 0.001% to-day.

101. Natural uranium and slightly enriched uranium requirements for the installation of a capacity of 1,600 MWe may be set at around 1,500 tons. Needless to say, however, this quantity must, in order to be loaded in reactors due for commissioning in 1966, be made available in tote before 1965. The annual consumption involved for a power output of this magnitude may be estimated at about 340 tons of natural and slightly enriched uranium.

The operation of plants supplying a power of 1600 MWe as from 1966, on the other hand, means that at least 340 tons of irradiated fuel would have to be reprocessed annually, although this total will only be reached at the beginning of 1968 or 1969, in view of the stay-time for the fuel in the reactors. Eventually, the reprocessing of the quantities referred to above would lead to a yearly output of about 800 kg of plutonium.

These various figures represent, however, only absolute minimum values, since the rate of construction of nuclear installations can by no means be expected to level out in 1966 but will show a steep increase in the ensuing years.

* * *

102. For the time being, only provisional estimates can be established for the cost, since no large-scale nuclear power plant for electricity production has yet gone into operation in Europe. These figures are therefore debatable, as also is any forecast of the exact date when nuclear electricity will become competitive.

Even so, many persons prominent in science and industry and having some experience of nuclear matters are agreed that during or by the end of the present decade the nuclear kilowatt hour will be in position to compete with electricity obtained from conventional energy sources.

When this breakthrough occurs, nuclear plants will become such a valuable economic proposition that there is bound to be a mushroom expansion in new power reactor construction.

103. In view of these well-founded forecasts, the Community has a duty, in the public interest, to promote and stimulate by all means in its power the adaptation of industry to the new requirements deriving from the increasing use of nuclear energy, and to do so within a relatively short space of time.

The transition from the laboratory and prototype stage to the industrial phase in nuclear energy production is a particularly difficult process since a tremendous amount of investment must still be sunk in a form of operation which is not yet profitable. It is these two reasons which motivate the electricity producers' reluctance to commit themselves and which impose on the competent public authorities a continued responsibility to lend financial and technical aid to all the sectors concerned until such time as operation becomes competitive.

The most important object of this assistance is to facilitate the construction of full-size power plants, thus making it possible to acquire the technical experience essential to the construction and operation of such plants on a favourable economic basis. The Commission's contribution, apart from its own research and development activities, has assumed two main forms: the conclusion of the Agreement for Cooperation with the United States for the development of reactor strings proven in America, coupled with participation in power reactors.

But the Community's efforts in this field cannot be limited to furthering the construction and operation of nuclear power plants. It must, at the same time, foster the creation of industrial fuel element fabrication and irradiated fuel reprocessing plants and prepare the ground for the institutional infrastructure of the nuclear economy sector (insurance, free movement of manpower, nuclear common market, etc.).

B. *The Nuclear Industries and Problems Bound up with the Operation of Nuclear Power Plants*

104. The Community's "List of Nuclear Installations" published by the Commission in June 1961, shows that these installations are often limited in number and that as a general rule their production capacity is low.

While the circumspection with which the industrial infrastructure is being set up is warranted by the slow rate of development of the various power plant programmes under way, the fact must not be overlooked that, in this field too, active measures must be taken to meet a foreseeable and rapid expansion of the market.

In particular, the following issues will have to be settled in detail by the end of the present decade, with the economic risks kept down to a minimum: fuel supplies and the fabrication of fuel elements; the transport of fresh fuel; and then the still more difficult question of irradiated fuel and its reprocessing. The Commission is endeavouring to devise or suggest solutions as the problems involved come into clearer focus. For instance, it is stimulating the development of the Community's fabrication facilities for the fuel elements required to replenish supplies for power and research reactors and, while keeping abreast of the reprocessing projects at present in the planning stage, it is likewise seeking, in collaboration with the parties concerned, to coordinate the transport and reprocessing of irradiated fuels.

With regards to institutional infrastructure, the problems connected with third party liability and insurance coverage for

nuclear hazards have engaged the Commission's attention since as far back as 1958, and a solution is now in sight. The same is true of the problems relating to free access to specialized employment and the free movement of nuclear products.

However, answers still have to be found to a number of questions of a practical nature, particularly with regard to insurance. These questions are now being examined by the Commission in conjunction with the competent authorities both in and outside the Community.

C. *Other Applications of Nuclear Energy*

105. Other peaceful applications of nuclear energy are also engaging the attention of the Commission, which is doing everything possible to develop them.

Some applications, such as the use of radioisotopes for medical, agricultural or industrial purposes, are by no means as spectacular as the production of electricity. Through its information bureau "Eurisotop", the Commission is endeavouring, with the support and cooperation of the parties concerned, to widen the range of industrial applications of radioisotopes.

Other applications will only pay their way in the longer term—e.g. nuclear propulsion of merchant vessels. In this sector, the Commission has concluded certain research projects and technical and economic studies with various enterprises and experts in the Community.

II. Power Reactors

A. *Current Community Programmes*

106. The Community's programmes have not undergone any appreciable changes during the past year and are still, for the most part, of an experimental character.

Germany. In addition to the low-power reactor already in operation at Kahl, work has been in progress since January 1961

on the construction at Jülich of a 15 MWe high-temperature gas-cooled reactor by the AVR (Arbeitsgemeinschaft Versuchsreaktor GmbH). Mention must also be made of the 50 MWe multi-purpose research reactor (equipped with pressure vessel), the construction of which was started at Karlsruhe in July 1961.

The studies undertaken by the three companies: Atomkraftwerk Bayern, Studiengesellschaft für Kernkraftwerke and Kernkraftwerke Baden-Württemberg Planungsgesellschaft have been pursued with the financial backing of the German Federal Government.

The development programme for 5 MWe-25 MWe prototype reactors has entered its initial phase. The firms responsible for carrying out the design studies—Allgemeine Elektrizitätsgesellschaft (Frankfurt-am-Main), Babcock and Wilcox (Oberhausen), BBC/Krupp (Düsseldorf) and Interatom (Bensberg)—receive Government subsidies ranging from DM 16 million to DM 19 million.

Belgium. Reference should be made to the 10.5 MWe BR3 reactor built at Mol and the participation of Belgian enterprises in the Société d'energie nucléaire franco-belge des Ardennes (SENA), which is to construct the pressurized-water reactor power plant at Chooz.

France. Further headway has been made with the implementation of the programme set out in the previous General Report, which comprises three graphite-gas reactors at Chinon (EDF 1, EDF 2 and EDF 3), the heavy-water reactor EL 4 to be constructed in the Monts d'Arrée (Brittany) and the above-mentioned SENA plant at Chooz.

Furthermore, in response to a call for bids, the Groupement de constructeurs français has submitted a tender for a nuclear power plant to be installed in India (390MWe with two reactors) and intends to compete for a contract to build a power plant in Brazil.

Italy. The two power plants under construction, one at the mouth of the Garigliano (SENN) and one at Latina (SIMEA),

as well as the SELNI project at Vercellese, are now accompanied by a project for the construction of an organic-cooled prototype reactor (Prototipo Reattore Organico, PRO) which will serve as the pivot for several series of applied research operations.

Netherlands. The Samenwerkende Elektriciteits Productiebedrijven (SEP) is pressing ahead with design studies for a 50 MWe power reactor.

B. *Implementation of United States/Euratom Agreement*

107. Under the United States/Euratom Agreement for Cooperation, the Euratom Commission, in conjuction with the United States Atomic Energy Commission (USAEC), issued on 21 September 1961 a second Invitation for proposals under the Joint Reactor Programme. The nuclear power plants to be constructed within the scope of this Invitation during the second phase of the Programme must be commissioned by 31 December 1965. Under the terms of the new Invitation, operators enjoy improved facilities, especially as regards enriched uranium supplies; they may either continue to purchase this material on a deferred payment basis, subject to 4% interest per annum on the declared value, or else—and this is a considerable advantage—hire it at a rate of 4.75% of the declared value.

In response to this Second Invitation, the Société d'énergie nucléaire franco-belge des Ardennes (SENA) submitted a proposal for a power plant operating on a 210 MWe pressurized-water reactor (PWR); this power can be stepped up to 242 MWe.

After the Euratom Commission and the United States Atomic Energy Commission (USAEC) had agreed to the inclusion of the Garigliano plant in the US/Euratom joint programme, a basic contract defining the procedure for cooperation between the two partners was signed on 25 July between the Euratom Commission and the Società Elettronucleare Nazionale (SENN), the sponsor of the project. At the same time, SENN and the USAEC signed the framework contract setting out the fuel-cycle guarantees granted by the latter. The construction work is proceeding

smoothly, so that the plant is expected to be ready for commissioning by the autumn of 1963.

C. *Steps Taken by the Commission to Promote Power Reactor Construction*

1. *Need for Community Participation in Power Plant Construction*

108. The nuclear power plants will only be able to fulfil their supporting function with regard to conventional energy sources, which by themselves are no longer capable of meeting the growing power demand, if their sponsors can rely upon

a) an adequate industrial potential,
b) an earning capacity comparing favourably with that of conventional power plants and
c) the availability of staff possessing the requisite nuclear skills and experience. Euratom's fundamental task, therefore, is to create these three essential conditions.

In order to provide a solid basis of experience in these fields, it is necessary to construct power plants on an industrial scale, as this is the only way to put the technological problems involved in their true perspective, to check the results of previous research and to operate in conditions corresponding to the practical requirements of energy production.

However, industrial-scale experimental research entailing the construction of large power reactors will remain a very expensive business as long as they continue to produce power at a higher cost than conventional electricity. While this situation persists, the industrial-scale experiments essential to the development of the Community's nuclear potential will have to be boosted by Euratom assistance.

2. *Basis of Community Participation*

109. A concrete and effective policy, taking full advantage of the experience gained throughout the Community, could not be

limited to the participation in three power reactors as envisaged in the Community's initial Research and Training Programme (Annex V to the Treaty).

On the other hand, based as it is on the fact that the nuclear kWh is only temporarily non-competitive, the policy governing the part which the Community takes in power reactors must be subject to certain time restrictions, and will naturally have to be dropped once the economic breakthrough has been achieved.

Acting on the Commission's proposal, the Council of Ministers, by its decision of 3 July 1961, accordingly:

— decided to replace the words "three power reactors" by the words "several power reactors";

— fixed the ceiling to the Commission's commitments for participation in power reactors to 32 million EMA u.a.

This measure does not imply any participation in the registered capital of the enterprise or any right of supervision by the Commission of the latter's management.

In return for its participation, Euratom has the right of access to the practical results obtained in the fields of design, construction, start-up and operation of nuclear power plants, both as regards the reactor itself and the fuel elements, and is also empowered to pass on the information gained in this way to the Member States, individuals and firms in the Community.

3. *Ways and Means of Participation in Power Reactor Construction*

110. Euratom participation can follow various lines according to the circumstances, the site selected and the power economy conditions in which the reactor will operate.

Among the wide range of possibilities[1], the Commission adopts the one most suitable for achieving the object in view.

(1) Research and development programmes may in some cases be carried out in connection with reactors in which Euratom is participating, but such activities do not come within the compass of the general scheme for participation in power reactors.

Some types of participation were listed by way of example in the previous General Report.

Should Euratom participation be made contingent on the fabrication of certain plant components within the Community, several entreprises representing at least two Community countries must be approached.

4. *Access by the Community to the Results Gained Under Projects in Which it Participates*

111. To enable the Community to benefit from the results obtained under schemes in which it participates, the Commission has established the following procedure:

— seconding to enterprises of employees of the Commission and persons independent of the Commission but appointed by it, in agreement with the enterprise, to follow the activities of the operator's personnel in the fields of plant design, construction and operation and, while there, to carry out studies of all the aspects of such activities and all the experience which they yield;

— drafting of detailed reports by both the enterprise's own personnel and the personnel seconded by the Commission;

— appointment by the Commission of trainees from various Community countries to receive specialized training in the enterprise;

— periodical meetings between members of the Commission's personnel and representatives, approved by the Commission, of enterprises with which a contract of participation has been concluded or which are also interested in the construction and operation of power reactors in the Community.

Information acquired by such methods will be disseminated and, where appropriate, published by the Commission. It will in fact be circulated in a still more effective manner as a result of the rapid turnover of staff entailed by the Community's participation. The Commission ensures that such exchanges of personnel are organized in such a way as to result in the most balanced possible distribution of information.

If certain information is patented by the contracting party, the Commission demands for its own purposes a non-exclusive royalty-free licence on the patents.

5. *Contracts of Participation*

112. The Commission has received several applications for its participation in power reactors.

The proposals submitted by two companies have given rise to contracts; the companies in question are:

— the Società Elettronucleare Nazionale (SENN), which is having a power plant with a net capacity of 150 MWe, and equipped with a double-cycle boiling-water reactor, built near the mouth of the Garigliano to the north of Naples;

— the Società Italiana Meridionale Energia Atomica (SIMEA) which has undertaken the construction of a power plant with a net capacity of 200 MWe, and equipped with a natural uranium-graphite-carbon dioxide type reactor, near Latina (to the south of Rome).

— Another similar contract has been worked out with the Société d'énergie nucléaire franco-belge des Ardennes (SENA), which is to set up at Chooz (near Givet) a power plant equipped with a pressurized water reactor and having an installed capacity of 210 MWe (which can be stepped up to 242 MWe).

One proposal submitted did not satisfy the criteria and provisions laid down by the Commission and could not therefore be adopted.

Decisions on the other applications can only be taken at some later date, when the Commission has been supplied with more detailed information on the projects to which they relate.

6. *Euratom Participation in the SENN and SIMEA Power Plants*

SENN

113. The total amount involved in such participation is 7 million EMA u.a., which breaks down as follows:

a) Participation in additional start-up expenditure up to a ceiling of 3 million EMA u.a.

The experiments and tests necessary to develop a nuclear power plant and to bring it up to power operation are more lengthy and difficult than in the case of a conventional plant. In practice this means operating for the first few years at a lower annual rate of energy production than a conventional plant.

The Commission has therefore decided to share in the extra expenditure incurred by the contract partner during the running in period as compared with the charges involved for a conventional plant of the same power rating.

b) Participation—to the tune of 4 million EMA u.a.—in the fabrication cost of fuel elements (slightly enriched uranium oxide pellets, zirconium alloy cladding) in the Community.

SIMEA

114. Participation—up to 4 million EMA u.a.—in the fabrication cost of fuel elements (natural uranium metal, magnesium alloy cladding).

D. *Development of Fuel Elements*

1. *Types of Fuel Element*

115. A European market in fuel elements is now being built up and sufficiently advanced fabrication processes have been evolved for the following types:

a) Magnesium-alloy-clad uranium metal elements, which have been developed for graphite-gas reactors; they are the only ones already being produced on an industrial scale in the Community for the requirements of the French Atomic Energy Commission (CEA) and Electricité de France (EDF).

b) Elements involving the use of sintered uranium oxide pellets with a stainless steel or zirconium alloy cladding. This type—which is used mainly in water reactors—has been brought to a particularly advanced pitch of development by United States industry. Several Community firms are also engaged in the fabrication of such elements which, however, are for the moment only in the prototype stage.

c) MTR-type elements for research reactors, which consist of sandwiches of highly enriched uranium and aluminium alloy between two aluminium plates. Several firms in the Community have already fabricated prototypes of these elements.

d) Aluminium-clad natural uranium metal elements destined for use in research reactors of the heavy water-gas types or for critical assemblies. This is a relatively simple process and the Community's industry has been able to supply elements of this type for EL 3, FR 2, ECO, etc.

2. *Manufacturers*

116. Several firms are now engaged in the fabrication of elements or parts, while others have announced their intention of doing so.

The supplying of research and power reactors already in operation or scheduled for commissioning during the coming years could be undertaken by these Community producers under fairly satisfactory technical and economic conditions. Stress must, however, be laid both on the fact that fuel element manufacture is relatively expensive and on the very special and delicate technical problems involved.

In order to cut costs and resolve these problems, the active cooperation of manufacturers, reactor operators and public bodies is highly desirable. Optimum economic conditions for production can only be brought about by a combined effort aimed at obviating inordinate investments in the face of a comparatively limited

market by specialization and by taking full account of the technical capacity and specific experience of each of the enterprises concerned.

Without such cooperation, certain laudable endeavours in this direction might prove abortive for want of either subsequent expansion facilities or markets. Industrialists are, moreover, fully alive to this danger.

3. *Policy of the Commission*

117. The fuel elements industry can only make progress if assured of a large market. It is therefore necessary to stimulate the growth of demand and to ensure that Community enterprises are in a position to meet it, at the same time taking care that the reactor operators are not thereby obliged to bear heavier burdens or to run greater risks than if they obtained their supplies outside the Community.

The Commission has accordingly made provision in the contracts of participation with SENN, SIMEA and SENA for the contribution of a total amount of approximately 15 million EMA u.a. towards defraying the cost of manufacturing within the Community elements for the reloading of the reactors operated by these three companies. Similarly, the Commission is exploring methods designed to ensure that the fuel element requirements of the research reactors in the operation of which it is participating (BR 2 at Mol, HFR at Petten, etc.) are met by Community facilities.

Furthermore, the Commission has placed orders in the Community for the elements to be used for the critical experiment ECO (40 tons of natural uranium content). Finally, it is also studying the most suitable ways of facilitating the in-pile and out-of-pile testing of fuel elements fabricated in the Community. (1)

(1) See chapter on "Research".

III. Nuclear Common Market

A. *Free Trade in Nuclear Products*
Common External Tariff

118. By the terms of the agreements concluded by the Member States on 22 December 1958, the nuclear common market came into operation on 1 January 1959.

The common external tariff makes no provision for duties on the products shown in List A1 of Annex IV to the Treaty (ores, source materials and special fissile materials) with the exception of processed uranium in a form other than bars, sections, etc., to which a customs duty of 2% is applicable. As regards the products given in List A2, the duties range from 0 to 12%; in most cases, the fixed rate has been either partially or wholly suspended for a limited period. Thus the 10% duties laid down for deuterium and its compounds, as well as for nuclear reactors and their components and spare parts, were suspended until 1 January 1962.

The agreement of 22 December 1958 on the fixing of the common external tariff for List A2 products specified that the Commission should submit to the Member States by 31 December 1961 a report on which the Council of Ministers would base its decision as to whether and to what extent the suspension of these duties should be maintained. This report was duly submitted by the Commission to the Member States in September 1961; it contained a proposal that, in the light of technical, economic and political considerations, the period of total suspension of duties should be extended by four years.

At the same time, the Commission published a note concerning fuel elements. In 1957, the Customs Cooperation Council had decided to classify fuel elements (active fuel slugs) as processed uranium. However, the advances made in technology have led to the fabrication on fuel elements which have undergone more elaborate processing than simple uranium rods clad with another metal. The Customs Cooperation Council therefore decided in

1961 to classify fuel elements under the heading "Nuclear Reactors" (item 84.59 B—"Nuclear Reactors"—of the Brussels Nomenclature). In its note, the Commission proposed the creation of a sub-heading "Fuel Elements", with the relative customs duty maintained at nil.

On 5 March 1962, the Council of the EEC, whose purview covers this field, decided to maintain the rates of duty in the common customs tariff for reactors and their components and spare parts at 10% and to fix the rates of duty for fuel elements at 10%, on the understanding that a partial suspension of these duties would be applied as from 1 January 1962 in such a way as to reduce them to:

a) 7 % for a period of four years in the case of reactors, components and spare parts;

b) 2 % for a period of three years, and 5% for one year after the expiration of this initial three-year period, in the case of natural-uranium fuel elements;

c) 0 % for a period of five years in the case of enriched-uranium fuel elements.

As regards deuterium, the Council decided that the common customs tariff duty was to be maintained at 10% but would be totally suspended up to 31 December 1964.

B. *Mobility of Labour with Regard to Qualified Employment in the Nuclear Field (Article 96)*

119. In accordance with the terms of Article 96, paragraph 2, of the Treaty, the Commission's draft directives on free access to specialized employment in the nuclear field was passed by the Council to the European Parliament.

The Parliament expressed an opinion in favour of the Commission's proposal. At the same time, it emphasized the need to avoid any risk of a clash between the Euratom directives and the measures concerning the free movement of workers enacted by

the Council of the EEC after the Commission's proposal had been laid before the European Parliament ("Journal Officiel" of 26 August 1961).

Following these observations and discussions with experts from the Member States, the Commission, in conjunction with the competent departments of the EEC, drew up an amended version of this draft.

The text of this amended version, which was approved by the Council in March 1962:

— gave a definition of "specialized employment in the nuclear field" referred to in Article 96 of the Treaty;

— laid down the principle that the permits necessary for the exercise of such activities must be issued automatically and in line with a procedure which must not be less liberal than that stipulated, in the case of vacancy notices specifying by name the person appointed, by the provisions issued pursuant to the EEC Treaty in regard to mobility of labour (Regulation 15: "Journal Officiel" of 26 August 1961);

— stated that any subject which it does not cover comes within the rules enacted within the framework of the EEC.

C. *Third Party Liability and Insurance in the Nuclear Field*

Draft Supplementary Convention to the Paris Convention of 29 July 1960 on Third Party Liability in the Field of Nuclear Energy

120. On the initiative and at the behest of the Commission, the experts of the Member States have worked out a draft Convention, of which only a few points of detail still remain to be settled by negotiation. The preparatory work on the Supplementary Convention to the Paris Convention of 29 July 1960 on third party liability in the field of nuclear energy is therefore, after several years of discussion, on the verge of completion.

The purpose of the Supplementary Convention is to underpin the system of compensation laid down in the Paris Conven-

tion by providing for drawings on public funds. Thus it has its legal basis in the Paris Convention, which is applicable to the extent that the Supplementary Convention does not adopt the derogation provisions contained in the Paris Convention.

The Supplementary Convention institutes the following system:

a) Under the Paris Convention, the operator of a nuclear installation is required to have taken out and to be maintaining an insurance or other financial guarantee up to an amount to be fixed by the national laws.

b) Under the Supplementary Convention, it is laid down that, in the event of damages exceeding the cover furnished by the operator:

— the State in whose territory the installation is situated shall intervene in such a way as to bring the total compensation up to an amount of 70 million EMA u.a.;

— if this State intervention proves insufficient, the contracting parties shall jointly, in the form of a collective guarantee, supplement the total compensation so as to raise it to a maximum of 120 million EMA u.a.

c) The Convention will apply to all nuclear installations for peaceful uses as covered by the definitions in the Paris Convention. Since, however, the term "peaceful uses" may give rise to difficulties in interpretation, a list must be compiled enumerating the installations governed by the Convention. This list, which will be regularly kept up-to-date, will, as soon as the time-limits for the lodging of objections have expired, have a probative value that cannot be rebutted.

d) Under these provisions, the field of application of the Convention is determined on the basis of these criteria: the site in which the installation of the operator concerned is located, the place of the accident, the point at which the damage is sustained and the nationality of the victims. The Convention applies when the following three conditions are fulfilled:

— the installation of the operator concerned is situated in the territory of a contracting party;
— the nuclear accident occurs in the territory of a contracting party or on the high seas; and
— the damage is suffered in the territory of the contracting parties or, irrespective of the place at which the damage is suffered, the victim is a national of the country of one of the contracting parties.

This field of application may be extended insofar as the non-Member State in whose territory the damage is sustained, or the non-Member State of which the victim is a national, guarantees nationals of all the contracting parties treatment comparable to that granted under the Supplementary Convention. In addition, each contracting party has the right to conclude special agreements with non-Member States and, under certain conditions, to include compensation paid under such bilateral agreements in the 120 million EMA u.a. total compensation laid down in the Supplementary Convention.

e) The allocation from public funds provided for in the Supplementary Convention may be granted:
— within the operator's liability, which rises to a ceiling of 120 million EMA u.a., or,
— should the operator's liability be limited to a lower amount, over and above this liability, within the framework of a direct liability on the part of the State or States.

The choice between these two alternatives, the first of which is dealt with in detail by the Convention, is left to the national legislature, which, if it adopts the second solution, must specify in particular that a single compensation procedure will be followed, irrespective of the origin of the funds.

f) The establishment of a breakdown formula for the collective intervention of the contracting States gave rise to protracted discussions, as the result of which a compromise solution was devised. The contribution of each contracting State will be determined as follows:

— as to one part, in the proportion determined by the ratio of its gross national product to the total gross national products of all the contracting parties;

— as to the other part, in proportion to the ratio of the total thermal power of the reactors installed in its territory to the total thermal power of the reactors installed in the territories of all the contracting parties.

g) The Convention contains provisions aimed at guaranteeing an equitable apportionment of the funds available for compensation of damage.

It is provided that non-Member States signatories to the Paris Convention may sign or associate themselves with the Supplementary Convention. In order to clarify the terms of the Supplementary Convention for the benefit of such non-Member States, a conference for the purpose was held in Brussels on 20 December 1961. Non-Member States who might be prepared to sign it agreed to take part in the final negotiations on this Convention, which started in February 1962.

Practical Problems of Nuclear Insurance

121. The Commission is now devoting even greater attention to the practical problems involved in insurance against nuclear hazards (carriage of radio-active materials, nuclear-powered vessels, utilization of radioisotopes, insurance provisions, statistics).

After having taken up these questions with representatives of the nuclear industry during the colloquy held at Tours in 1960 (see 4th General Report, p. 85) and with representatives of electricity producers at Formia on 27 and 28 April 1961, the Commission arranged a third colloquy on this subject, which took place at Wiesbaden on 19 and 20 October 1961.

This meeting, which was attended by leading personalities in the nuclear insurance world and also by representatives of electricity producers, supplied a need felt keenly in the sectors

concerned and led to the creation of a permanent working group of representatives of the Commission and nuclear hazard insurers.

This group, which has met at regular intervals since December 1961, commenced its activity with a study of insurance covering the carriage of radioactive materials.

It will thus be seen that the Commission is applying itself very actively to the tasks conferred upon it by Article 98 of the Treaty; the urgency of these problems was also emphasized in the report submitted on 5 October 1961 by the Parliamentary Commission on Health and Safety. If necessary, the Commission will, in the light of its work on nuclear insurance questions, draw up proposals containing directives for the application of Article 98.

Third Party Liability and Insurance Problems connected with the Operation of Nuclear-powered Vessels

122. The Commission took part in the work of the Diplomatic Conference on Maritime Law which was held in Brussels in April 1961 under the auspices of the Belgian Government and the IAEA and at which the broad lines of a draft international convention on the liability of operators of nuclear-powered vessels were established. A further conference of this type is planned for the spring of 1962 in order to settle the problems outstanding.

IV. Marine Propulsion

123. In the field of nuclear-powered merchant vessels, the Commission has continued its endeavours to foster the development and harmonization of the various activities initiated in the countries of the Community. From the proposals submitted to it, the Commission has selected those which appeared to be the most promising and whose importance had already been acknowledged at the national level. The current operations in which the Community is participating relate solely to theoretical and experimental studies and to the drafting of construction plans for well-defined projects.

The Commission is participating, both in the form of financial assistance and by seconding skilled manpower, in the work scheduled in the contracts referred to below. The information acquired during the implementation of these contracts will be widely disseminated in the Community, where it will prove of most benefit to the industries of the Member States.

In order to avoid duplication of effort and to keep the circles concerned abreast of current developments, the Commission has created a Liaison Group on Nuclear-Powered Merchant Vessels, which is responsible for examining at regular intervals the status and results of the various research projects and other work in progress. This group, which is made up of representatives of the contracting parties and Governments, held its first meeting at Hamburg on 23 February 1962.

1. *Gesellschaft für Kernenergieverwertung in Schiffbau und Schiffahrt mbH, Hamburg, and Internationale Atomreaktorbau GmbH (Interatom), Bensberg/Cologne*

124. Under the contract of association concluded by the Commission with these two enterprises on 27 January 1961, the plans for a ship driven by an organic-liquid-cooled and moderated reactor have been finalized.

After the bids submitted by shipyards for the construction of the hull had been examined, preference was given to a 15,000-ton bulk carrier tendered by Kieler Howaldtswerke AG. The design of the ship, which is intended mainly for testing purposes, provides for the installation of laboratories and equipment for the handling of nuclear fuel and wastes.

Kernenergie (Hamburg) a non-profit making association, after obtaining the agreement of the authorities which exercise supervision over its activities, has already reached a decision in principle to carry out the project and has applied to the German authorities for a construction and operation permit.

2. *Reactor Centrum Nederland (RCN)*

125. Negotiations with the RCN resulted in the conclusion of a contract of association, which was signed on 1 December 1961.

The work scheduled under this contract bears on the designing of an advanced pressurized-water-type reactor suitable for use as a merchant vessel drive unit. The principal items are a critical experiment, the installation of two loops in a highflux reactor, the construction and running under operating conditions of a steam generator and superheater model, and tests connected with the development of nuclear components and control systems.

3. *Fiat Ansaldo*

126. On 15 December 1961, the Commission entered into a contract of association with the Italian companies Fiat and Ansaldo

The study, research and development programme is devoted to the drafting of a complete design for a nuclear-powered tanker. It prescribes in particular the submission of a preliminary safety report and a detailed construction estimate. The programme does not concern the reactor alone, but also deals with various problems of naval architecture connected with the assembling of the reactor on board and its operation at sea.

The initial phase of the work consists in a comparative study of four types of water reactors, namely, forced-circulation pressurized-water reactor (PWR), natural-circulation pressurized water reactor (PWR), direct-cycle boiling water reactor (BWR) and indirect-cycle boiling water reactor (BWR).

The type of reactor considered as the most promising at the conclusion of this comparative study will then be incorporated in a programme to be carried out in four phases, i.e. :

1) Development of a complete draft design for a nuclear-powered tanker;

2) Development of a final design for the drive system and exact cost estimates;

3) Drafting of the construction blueprints;

4) Construction of the ship.

The Commission will only cooperate in the first two phases, in which Ansaldo will be responsible for the naval construction and Fiat for the nuclear drive section.

4. *Gesellschaft für Kernenergieverwertung in Schiffbau und Schiffahrt mbH, Hamburg*

127. On 31 October 1961, the Commission signed a second contract with Kernenergie (Hamburg) relating to an experimental programme on the development of various reactor types destined for use as merchant marine propulsion units.

The programme's main object is the construction of radiological shielding which must offer a combination of extremely small dimensions and weight coupled with very high safety standards. The experiments are performed with the swimming-pool reactor at Geesthacht, near Hamburg, which, specially designed for shielding tests, is equipped in addition to the swimming-pool with one large channel and irradiation tubes.

Furthermore, the mechanical strength of marine reactor components, with particular reference to the fuel elements and control rods, is checked with a test device reproducing the acceleration forces to which a ship is subjected at sea.

5. *Technical and Economic Studies*

128. Two Community experts have been commissioned to determine what combination of type of vessel, tonnage, speed and range would be most favourable from the standpoint of making nuclear propulsion competitive as compared with conventional drives.

With this in view, the contract-holders calculate the maximum permissible operating expenditure for nuclear marine propulsion units in such a way that the total transport costs are equal to those of a conventional ship selected as a reference. The calculations will cover a range of possibilities in order to

arrive at a total cost figure the limit values of which will encompass the total costs obtaining within the Community. The studies are concerned primarily with tankers and large combined tanker ore-carriers, and also medium-sized fast freighters, on the basis of various routes.

6. *Legal aspects of Nuclear Marine Propulsion*

129. The legal problems now facing the authorities of the Member States in connection with the development of nuclear marine propulsion relate in particular to:

1) the conditions governing the access of the vessel to territorial waters and to ports (1);

2) third-party liability for damage resulting from nuclear accidents which might be caused by such vessels (see paragraph above on third-party liability and the covering of nuclear risks).

The Commission is following closely the efforts undertaken to solve the legal problems bound up with nuclear-powered merchant vessels, for which purpose it is maintaining the necessary contacts with the appropriate authorities of the Member States.

For nearly two years, the Member States have been negotiating with the United States bilateral agreements relating to the conditions which should govern the admission of the American cargo-passenger vessel "Savannah" into their territorial waters and harbours. No agreement has yet emerged, the biggest stumbling-block for most of the Member States being the problem of third-party liability.

The Commission, for its part, has, in conjunction with two shipping registration bureaux in the Community—the Bureau Veritas and Germanischer Lloyd—undertaken a safety assessment of the "Savannah"; the results have been forwarded to the

(1) For legal problems raised by the development of nuclear propulsion for merchant ships in the field of health and safety, see Chapter IV of this Report.

authorities and experts of the Member States and to enterprises in the Community.

In this way, the Commission aims at helping the competent authorities of the Member States of the Community in the drafting or adaptation of the legal provisions and administrative and technical measures to be enacted for the "Savannah's" calling at European harbours and for the subsequent operation of other nuclear-powered vessels in coastal and port areas.

V. Measures Adopted in Connection with the Industrial and Technological Uses of Radioisotopes and Radiations

130. The information bureau set up by the Commission came into effective operation in November 1961 under the name of "Bureau Eurisotop". Its work programme corresponds, in broad outline, to the Commission's projects, which were discussed and given farreaching support by the representatives of producers and users of radioisotopes at a meeting held in Brussels on 27 and 28 February 1961.

A consultative committee composed of representatives of producers and users is being set up. The Bureau will be assisted by a number of sub-committees comprising experts from the Member States having specialized knowledge of particular fields of application or certain branches of industry.

A publicity and information campaign has been prepared, the salient feature of which is the publication of handbooks and papers on the various aspects of radioisotope applications. These brochures and booklets, being specially tailored for the public for which it is intended, will embrace, alongside works of a technical and scientific nature, also material of a popular character aimed at the general reader.

The collection and analysis of the data relating to the widest variety of radioisotope applications have been continued.

The Commission attaches particular importance to close contacts with industry, on the one hand in order to promote

the development of improved and novel measuring techniques, and on the other hand, in order to evolve, in cooperation with the industrial engineers, new applications or new processes.

The Commission, which is backing this campaign with both technical and financial assistance, will take account of all the experience which has already been acquired by the individual states.

131. With this aim in view, the Commission has set about the conclusion with Community enterprises of contracts relating to practical problems involved in the application of radioisotopes, and more particularly:

Development of a rapid process for measuring the thickness of thick plates in hot-rolling;

Wall thickness measurements in long tubes;

Dispersal of static electricity by means of a gas current ionized by nuclear radiations;

Calibration by means of radioisotopes.

Other contracts are still in the process of negotiation. This contract policy will be pursued even more intensively in 1962.

VI. Supply

A. *Supply Agency*

132. The Supply Agency has carried on with its activities under the supervision of the Commission and in close cooperation with its Consultative Committee.

The Consultative Committee held two meetings during the present reporting period. At the meeting held on 9 May 1961, Mr. J. MABILE, Head of the Production Division of the French Atomic Energy Commission (CEA), was elected Chairman.

During the first two years, the Committee was called upon to deal mainly with matters of organization and procedure,

whereas its attention in recent meetings has been directed more to problems of a practical nature affecting users and producers in the Community. It has examined, inter alia, certain questions related to the supplying of the Community with special fissile materials, the reduction of the conversion cost for natural and enriched uranium and various features of the Community's long-term natural uranium supply policy.

B. *Transactions*

1. *Natural Uranium; Thorium*

133. The simplified procedure introduced by the Commission's directive published in the "Journal Officiel" of 30 November 1960 was applied to transactions involving natural uranium in whatever form.

Under this simplified procedure, producers and users may negotiate contracts freely, such contracts being considered as having been concluded by the Agency if it makes no comment within eight days of receiving notification.

Since the date of introduction of this procedure, i.e. between 1 December 1960 and 15 March 1962, a total of 127 transactions were concluded in respect of 197,119 kg contained uranium and 13 transactions covering 1,300 kg contained thorium.

Under the same procedure, there were four transactions in the form of imports from the United States and the United Kingdom relating to a total of nearly 20 kg contained uranium.

On the export side, there was no appreciable activity on the part of Community producers, seven permits being granted by the Commission for exports of source materials under the terms of Article 59 of the Treaty involving a little over 15,000 kg.

2. *Special Fissile Materials*

134. As regards special fissile materials, six contracts relating to the import of approximately 38 kg of slightly enriched uranium

and 1 kg of plutonium have been concluded by the Supply Agency to meet requirements under the United States/Euratom Joint Research and Development Programme.

Under the Agreement for Cooperation with the United Kingdom, a quantity of 20 kg of slightly enriched uranium was imported by the Agency for the Commission's own research programme, as well as small amounts of plutonium for the use of the Central Nuclear Measurements Bureau.

C. *Prices*

1. *Natural Uranium*

135. It is still too early to speak of a natural uranium market in the true sense of the word. As examples of the wide divergence in prises may be quoted those now being paid by the United States Government for natural uranium in the form of concentrates of American origin (app. $ 8/lb U_3O_8) and the appreciably lower rates ($\pm$ $ 4/lb) applied for individual transactions on a small scale. The downward price trend, while appearing less marked than before, continues.

Short of a major advance in extraction techniques, the Commission considers that in the medium or long-term view the price of uraniferous concentrates might settle in the range between $ 6 and $ 8/lb U_3O_8. However, military requirements and strategic stockpiling purchases exceed by far the quantities used for peaceful purposes and exert a considerable effect on the fluctuations to which the uranium market is subject.

2. *Special Fissile Materials*

136. The United States has a virtual monopoly of sales of special fissile materials, particularly uranium enriched in U-235. The United States Atomic Energy Commission (USAEC) has drawn up new price scales for enriched uranium, which are 20 % to 40 % below those in force up to 1 June 1960, while the rental

for enriched uranium, which up to the same date was 4 %, has now been raised to 4.75 %.

The price at which the United States buys back uranium produced in non-American reactors has for the time being been maintained at $ 12/g. According to the USAEC, however, a calculation of the plutonium price on the basis of the methods used previously and in line with the new prices for enriched uranium would result in a drop of nearly 20 %, i.e. a new price of around $ 9.50/g of plutonium metal.

D. *Regulations Governing Transfers of Small Quantities*

137. The Commission has drawn up a set of regulations ("Journal Officiel" of 19 December 1961) based on the provisions of Article 74 relating to the contractual procedure for the transfer of small quantities of ores, source materials and special fissile materials. These regulations waive the application of the provisions of the Treaty Chapter headed "Supplies" with regard to the transfer, import or export of certain specifically defined quantities of ores and source materials, or to the transfer of still smaller quantities of special fissile materials within the Community.

E. *Outlook*

1. *Ore Prospecting*

138. In the field of prospecting, the Commission has examined the reports submitted to it by the Member States pursuant to the provisions of Article 70 and has passed them on to the Council. In view of the scale on which prospecting activities have been carried on in the Member countries, it has not deemed it necessary to make any recommendations in this respect. The Commission has requested the Member States to formulate their reports as from 1960 in accordance with a uniform pattern so as to enable the information obtained to be processed in a more rational way.

2. *Long-Term Outlook*

139. In order to form an idea of prices and availabilities in the longer term, the Commission, despite the present glut on the market is looking into the prospects as regards natural uranium supplies for the Community. A study is now being conducted by the Supply Agency's Consultative Committee, in cooperation with the responsible Euratom departments, with a view to compiling an inventory of the known reserves of uranium ore in the Community and the countries of the free world which can be extracted in the form of concentrates under various price hypotheses. This inventory will then show whether, in the light of the price of concentrates, it would be profitable to work these various ore deposits.

3. *Quantities of Special Fissile Materials Available*

140. Under the terms of the Supplementary Agreement which came into force during 1961, part of the quantity of special fissile materials earmarked for research purposes in the Euratom Agreement for Cooperation will henceforth be able to be used for certain research projects outside the framework of the Joint Research and Development Programme. In addition, the quantity of plutonium which the Community may have at its disposal has been increased from 1 to 9 kg.

With regard to the power reactors to be built under the Joint Programme, the Commission has also secured for operators the option of either purchasing the enriched uranium necessary for the running of such reactors on a deferred-payment basis at 4 % interest or else leasing it at the rate ruling in the United States, i.e. at present 4.75 %.

The Commission has furthermore negotiated with the USAEC a five-year option on the non-used remainder of the 30,000 kg of uranium-235 provided by the terms of the Cooperation Agreement for use in the power reactors to be constructed under the Joint Programme.

Finally, as the result of an agreement, the Commission has succeeded in reducing, if not entirely eliminating, the administrative difficulties which have hitherto made it impossible for Community producers to re-export enriched uranium imported from the United States and processed or shaped into fuel elements in the Community.

The Commission's intention in bringing about these relaxations is to facilitate the acquisition of special fissile material supplies and to put, as far as possible, the procedure for these materials on a par with that governing natural uranium supplies.

VII. Reprocessing and Transport of Irradiated Fuels

A. *Reprocessing*

1. *Demand*

141. A number of research reactors and small or average-size power reactors (which at the end of 1961 represented a capacity of approximately 270 MWe) are already operating in the Community. The figures quoted at the beginning of this chapter show that by the end of 1963, the total installed nuclear capacity is likely to pass the 700 MWe mark, reaching around 1,600 MWe by the end of 1966.

This means that irradiated fuel reprocessing requirements may be expected to follow a steep upgrade (approximately 340 tons per year from 1968-1969 onwards).

2. *Meeting the Demand*

a) *General Facilities*

142. Reactor operators will be compelled to send their fuel to the United States and/or to the United Kingdom for reprocessing if the necessary facilities to meet these requirements are not set up in the Community in economic and technical con-

ditions which are acceptable from both a quantitative and a qualitative standpoint. Inherent in this dependence on non-member countries is the risk that the smooth flow of the Community's supplies may be disturbed, and on the other hand the long hauls involved raise a number of economic and safety problems.

In particular, the reprocessing of highly enriched uranium fuel is an extremely expensive business in the United States, mainly because of the high transport costs and insurance premiums. What, then, is the present situation in the Community ?

b) *Present Facilities and Prospects in the Community*

143. Apart from the facilities installed in France (1) to handle natural uranium fuel, the only measures which have been taken so far in Europe are as follows :

1) Eurochemic, a company set up under the European Nuclear Energy Agency, is to construct at Mol (Belgium) an experimental reprocessing plant with a rated daily capacity of 350 kg of natural uranium fuel or 200 to 250 kg of slightly enriched (5 % or less) uranium fuel.

This plant could be adapted to the reprocessing of highly enriched uranium fuels.

2) In Italy, the Italian Atomic Energy Commission (CNEN) has embarked upon the design of a plant for the reprocessing of highly enriched fuels (2). This installation is to be linked up with a metallurgical fuel element fabrication plant in such a way as to complete the fuel cycle.

(1) Plant at Marcoule for the reprocessing of fuel for the G_1, G_2 and G_3 reactors; plant—under construction—at Cap de la Hague (Cherbourg) for the reprocessing of fuel for the reactors of the Electricité de France (EDF) power plants.

(2) Not to be confused with the Italian plant PCUT (uranium-thorium cycle programme), which is designed for the reprocessing of fuel for the boiling-water power plant at Elk River (US) with the object of examining the technical and economic conditions governing the thorium-uranium 233 cycle in thermal power reactors.

Certain design modifications should enable this plant to satisfy the Community's entire highly enriched fuel reprocessing requirements.

3) By means of a technical study, experts of the French Atomic Energy Commission (CEA) have demonstrated the possibilities of a plant capable of precessing both enriched uranium and plutonium-based fast reactor fuel and highly enriched uranium and aluminium-alloy fuel as employed by research reactors.

3. *Commission's Activities*

144. The Commission's activities to date have developed along the following lines:

1) Permanent study of technical and economic problems which have arisen and which will continue to arise in the field of reprocessing in the Community.

2) Study of the possibilities for coordinating the chemical reprocessing of highly enriched fuels in the United States.

3) Study of such technical and economic advantages as may be offered by single-purpose processing plants which have been built into certain particular types of nuclear power plant. In the course of 1962, the Commission plans to organize a colloquy on this subject, to which experts will be invited.

4) Examination, in the case of highly enriched fuels, of the respective advantages offered by the three projects already referred to, viz.:

— adaptation of the Eurochemic plants;

— Italian project;

— the study carried out by the CEA.

Should it emerge from this comparative study that none of these projects holds out a satisfactory solution (from either the technical or the economic standpoint), the Commission will investigate the expediency of setting up a "Euratom" plant.

* * *

Survey of the Possibilities for Coordinating the Chemical Reprocessing of Highly Enriched Fuels in the United States

145. Until such time as suitable facilities become available in the Community, the Commission, with the full agreement of the reactor operators and the United States Atomic Energy Commission, is endeavouring to coordinate the reprocessing of highly enriched fuels in the United States (Idaho Falls plant).

The problem for which a solution must soon be devised may be put as follows:

A number of research reactors in operation or projected in the Community use highly enriched uranium fuels obtained from the United States. After irradiation, these fuels will have to be chemically reprocessed.

The reprocessing cost can be cut appreciably if the fuel batches to be reprocessed in a single run are increased (within certain limits, which for all practical purpose means between 400 and 800 kg).

This cost reduction is effected by a more rational spreading of the relatively high fixed costs involved in the start-up, shut-down and clean-up of the reprocessing plant of each reprocessing run.

The frequency with which the load has to be renewed for the BR 2 at Mol and the HFR at Petten is by far the greatest, and thus coordination should be planned on the basis of these two reactors. The fuels used in the other research reactors in the Community could easily be combined with the consignments from BR2 and the HFR in order to increase the size of the fuel batches reprocessed in each run.

When these studies have been concluded, the Commission will put forward proposals embodying practical measures for the coordination of the reprocessing procedure.

This issue is, moreover, closely bound up with the problem raised by the coordination of irradiated fuel transport, which is dealt with below.

Transportation of Radioactive Materials

146. In the near future, the development of nuclear research and the nuclear industry in the Community will entail the transportation of increasing consignments of radioactive materials.

In order to bring about a certain measure of uniformity in the solution of the variety of problems involved in the carriage of these substances and to obviate the adoption of practices which it would subsequently be difficult and costly to weld into a harmonious whole, the Commission has taken the step of organizing a discussion of the matters at issue with a group of government experts working under the auspices of the Council of Ministers.

This group of experts and the Commission are agreed on the existence of two entirely distinct sets of problems, namely:

1. The measures to be taken with the object of:

a) standardizing, as far as possible, according to the purposes for which are used, packagings and containers subject to the approval of the Member States;

b) coordinating the existing or projected regulations and the administrative procedures governing approval of the means used for the transportation of radioactive materials in the various Member States.

2. The measures to be taken under the terms of the Treaty for the application of the Basic Standards to the transport of radioactive materials (1).

147. Furthermore, the transportation of consignments of radioactive materials will not be confined to the territories of the Member States. The government experts have therefore recognized that he measures to be taken in the two above-mentioned fields will be influenced by the regulations or measures adopted or envisaged either by some non-member countries (to which or

(1) See Chapter IV of this Report.

from which radioactive materials will be transported) or by other international organizations.

In order to facilitate cooperation in the field referred to in paragraph 1 above, a special group has been set up for the coordination of the transport of radioactive materials. It has a consultative capacity and is composed of representatives of the Member States and the Commission.

The task of this group is:

a) to coordinate the viewpoints of the various governments on the legal and administrative problems involved in the transport of radioactive materials, more particularly as regards the approval of packagings and containers as well as of the means employed for transporting these consignments;

b) to examine, in cooperation with the Commission, the technical and economic aspects of these problems.

The study of the measures to be taken for applying the Basic Standards to the carriage of radioactive materials will be continued in line with the rules and procedures laid down in the Treaty (1).

In view, however, of the fact that the problem of coordinating the transport of radioactive materials is bound up in so many ways with the application of the Basic Standards, the government experts and the Commission have taken the necessary steps to ensure close cooperation between the "Transport Coordination Group" and the Commission itself.

VIII. Links with Employers' Associations and Trade Unions

A. *Employers' Associations*

148. Relations with the electricity producers' and industrial equipment manufacturers' associations have been strengthened, in

(1) See Chapter IV of this Report.

particular those with the Union of European Community Industries (UNICE), the International Union of Producers and Distributors of Electrical Energy (UNIPEDE) and the International Federation of Industrial Producers of Electricity for Captive Consumption (FIPACE). In addition, contacts have been maintained with the European Atomic Forum and the corresponding national organizations.

Following the colloquy held at Tours with the nuclear equipment manufacturers (December 1960), the Euratom Commission organized two other meetings, one with the UNIPEDE at Formia in April 1961 and the other with representatives of the insurance sector at Wiesbaden in October 1961. These two events gave rise to an interesting exchange of views with the representatives of economic circles concerned in the development of nuclear energy. Similar meetings will be arranged as the need for them may be felt by the various sectors involved on the one hand and the Commission on the other. The Commission is at present engaged in preparations for a colloquy with FIPACE representatives to be held in the course of 1962.

Finally, relations have been established with the European Association of Advanced Business Management Training Centres for the purpose of giving enterprises a better idea of developments in the application of nuclear energy and of the legal, economic and social problems which have arisen in this context.

B. *Trade Unions*

149. The Commission has also made a point of amplifying as much as possible the volume of information supplied to the trade unions on Euratom's task and resources, and also on the development of nuclear energy in Europe and throughout the world. In cooperation with the "Trade Unions" Section of the Joint Press and Information Service, it has organized several information visits specially designed for the representatives of the trade-union organisations in the Six.

From discussions with trade-union leaders, the Commission has derived some interesting suggestions regarding social matters,

particularly in connection with the training of nuclear personnel and future manpower requirements in the nuclear energy sector.

The visits arranged by the Commission for the information of trade-unionists have been reported in the trade-union press, thus bringing nuclear energy questions to the notice of a wide section of the wage-earning public.

C. *List of Nuclear Installations*

150. As part of its policy of keeping the circles concerned abreast of developments in the nuclear energy field, the Commission has compiled and distributed 4,500 copies of a list of the nuclear installations which are either in existence, under construction or projected in the Community.

This document provides a survey of industrial or semi-industrial plants, classified according to the various sectors of activity directly involved in the development of nuclear energy.

The publication has been given a very favourable reception by government bodies and business enterprises, as well as among the various specialized professional groups concerned.

CHAPTER IV

HEALTH AND SAFETY

APPLICATION OF THE BASIC STANDARDS AND HARMONIZED LEGISLATION IN THE MEMBER STATES — PUBLICATION OF A SURVEY OF LEGAL PROVISIONS — REVISION OF ANNEXES 1 AND 3 AND OF ARTICLES 8, 9 AND 10 OF THE BASIC STANDARDS — INTERNATIONAL COOPERATION ON THE TRANSPORT OF RADIOACTIVE SUBSTANCES — COMPARATIVE EXAMINATION OF THE VARIOUS LAWS ENACTED IN THE COMMUNITY ON THIS SUBJECT — PARTICIPATION IN ACTIVITIES UNDERTAKEN IN THE COMMUNITY CONNECTED WITH NUCLEAR MARINE PROPULSION — OVERALL ORGANIZATION OF RADIOACTIVITY MONITORING AND STANDARDIZATION OF MEASURING METHODS — SUPERVISION OF PROJECTS RELATING TO RADIOACTIVE WASTE DISPOSAL AND SAFE REACTOR OPERATION — STUDIES RELATING TO MEDICAL HYGIENE AND SOCIAL PROBLEMS — COOPERATION WITH NON-MEMBER STATES AND INTERNATIONAL ORGANIZATIONS

I. Basic Standards and Harmonization of Municipal Laws

A. *Application of the Basic Standards and Harmonization of Laws in the Member States*

151. The Basic Standards, laid down in February 1959 by the Council in the form of directives, constitute the mainspring of the joint policy adapted by the Six in the field of protection against ionizing radiations. Today, three years after these standards were promulgated, it may be asked whether the situation is satisfactory and whether the Commission has grounds for hoping that in the near future all the Member States will have drawn up the legislative, regulatory and administrative provisions calculated to ensure their observance.

The 4th General Report had already alluded to the Commission's anxiety as to the progress made in this field, while the attention of the competent authorities had repeatedly been drawn to the importance it attached to this problem, which on several occasions had come up for debate in the European Parliament. However, the Commission is fully to the difficulties encountered by the responsible authorities in applying the Basic Standards in countries where problems arise in connection with competence, interdepartmental coordination and, in some cases, particularly deep-rooted administrative traditions. Even so, these obstacles would appear to be mainly of an administrative character and do not affect either the purpose or the essential features of the Basic Standards.

During 1961, the Commission successfully took steps designed to ensure compliance on the part of the Member States with the terms of Article 3 of the Treaty. Letters were sent to the Member States asking them to inform the Commission of the progress made in the implementation of the directives, and the same matter was submitted to the Council for consideration at its 43rd session (October 1961). The Commission also took note of the official statements made by some Member States to the effect that the various national research centres and the industries subject to governmental supervision were already to all intents and purposes applying the Basic Standards. However, the Commission does not consider this state of affairs entirely satisfactory, as in fact most of the Member Countries lack the legal machinery necessary for ensuring that the Basic Standards are applied everywhere and in every case. Accordingly, permanent contacts have been maintained and meetings held between the competent authorities of the Commission and Member States. In this way, the Commission has been able to follow the drafting of legal texts from the outset, which has made for a speeding-up of the work and enabled difficulties to be solved as and when they have arisen.

Furthermore, the Commission, in order to give adequate publicity to the legislative and regulatory provisions on radiolo-

gical protection already in force in the Six, has issued a three-volume publication listing the provisions in question (1). In this first edition, the texts have appeared in the original language, but a translation of them in the four Community languages is to be published in the near future.

The situation as it now stands may be summed up as follows:

Germany

152. As pointed out in the last General Report, the German Federal Republic, by promulgating on 23 December 1959 the law on the peaceful uses of nuclear energy and on safeguards against the dangers involved in such uses ("Atom Law") and by bringing into force on 1 September 1960 the decree on radiological protection, was the first of the six Member States to possess a specific set of regulations in line with the Basic Standards.

Belgium

The draft general regulations on the protection of workers and the general public against the hazards of ionizing radiations, the preliminary draft of which had been submitted to the Commission for perusal as far back as 1959, is now being examined by various national authorities. As soon as this examination is concluded, the Belgian Government will officially submit the draft to the Commission in accordance with the terms of Article 33 of the Treaty. In the meantime, the Commission is being kept abreast of the work in progress and joint meetings have been organized to hold unofficial discussions on various points of the text.

(1) Standards for protection against ionizing radiations—Digest of the provisions applicable within the European Community (October 1961)—3 volumes. Brussels, European Atomic Energy Community.

In this connection, mention should also be made of the legal, regulatory and administrative provisions already adopted by Belgium in the field of nuclear energy—namely, the law of 29 March 1958 on the protection of the population against the dangers resulting from ionizing radiations, the Royal Decree of 12 April 1960 on the possession and use of radioactive substances for medical purposes and the Ministerial Order of 6 May 1960 providing for the implementation of the aforementioned Royal Decree.

France

By the terms of a memorandum of 7 March 1962, published in the "Journal Officiel de la République française", the Basic Standards were made enforceable in France. Referring to Article 30 of the Treaty and the directives issued on 2 February 1959 by the Council, the memorandum lays down that: "these directives, which come into operation forthwith in France, must be applied and observed by all public and private bodies".

Further, in a letter dated 3 October 1961, the French Government referred to a number of texts in course of preparation which would shortly be able to be placed before the Commission.

Italy

It will be recalled that on 12 January 1960 the Italian Government had transmitted to the Commission, purely for information purposes and without instituting the procedure laid down in Article 33 of the Treaty, two preliminary draft texts drawn up by the Ministry of Health and the Ministry of the Interior respectively.

No draft has been submitted to the Commission since that date, but the latter has been kept informed on the activities of the Inter-Ministerial Committee set up at the Ministry of Foreign Affairs, and the joint meetings with representatives of this Committee have made it possible to review at regular intervals the

progress achieved in its work, which may be expected to culminate shortly in the adoption of a standard text.

Luxembourg

The bill concerning the protection of the general public against the dangers resulting from ionizing radiations, which was submitted to the Commission in 1958, has been referred to the Luxembourg Council of State for an opinion.

The Commission has also lent its aid to the preparation of a set of "Directives relating to protection against ionizing radiations emitted by radioactive substances" issued by the Association luxembourgeoise contre les Accidents.

Netherlands

Since the notification by the Dutch Government on 5 February 1960 of a nuclear bill, which is now being examined by the Second Chamber of the States General, two draft decrees have been submitted to the Commission.

In a letter dated 9 November 1961, the Dutch Government transmitted a draft Royal Decree for the adaptation to the Euratom Basic Standards of the decree of 20 March 1957 on protection against ionizing radiations. This draft was approved by the Commission on 24 January 1962.

Also by letter, dated 21 November 1961, the Dutch Government submitted a draft decree on radioactive materials for the purpose of bringing into line with Euratom's directives the Royal Decree of 21 June 1958 extending the application of Articles 14, 15 and 16 of the Sale of Food and Drugs Act to radioactive materials (Radioactieve Stoffenbesluit). This draft, to which a new text containing several amendments was added by the terms of a letter dated 8 February 1962, is now being studied.

To conclude, the Commission, while not entirely satisfied with the present situation, acknowledges the considerable efforts made by the Member States over the past few months to speed up

the enforcement of the Basic Standards in the most important sectors of nuclear activity.

B. *Revision of the Basic Standards*

1. *Revision of Annexes 1 and 3*

153. The revision of these annexes, which was foreshadowed in the 4th General Report, having duly passed through the various stages of the procedure outlined in Article 31 of the Treaty, was approved by the Council at its meeting on 5 March 1962.

The amendments which were introduced in the course of this procedure only concerned points of detail and the Commission's proposal remains virtually unchanged as regards the principles which underlay the drafting of these annexes. It may be noted that international organizations such as the Vienna Agency and the OECD have adopted the Commission's concepts and method of presentation in their own recommendations.

The public health authorities and the monitoring services in the Member States will thus have at their disposal a precise, straightforward document showing the maximum concentration values in water and air of all the radionuclides on which authentic scientific information is available at the present time.

2. *Revision of Articles 9 and 10 of the Basic Standards*

154. The proposals put forward by the German Federal Government in 1960 for the emendation of Articles 9 and 10 of the Basic Standards prompted the Commission to carry out a particularly thorough study on the question of the best formulae to be adopted in fixing the maximum doses in the event of planned or accidental emergency exposure.

C. *International Symposium on Legal and Administrative Problems of Protection*

155. The papers and other contributions submitted at the Brussels Conference on the Legal and Administrative Problems of

Protection (see 4th General Report, p. 95) contain a wide range of proposals, data and recommendations which are of considerable importance from the scientific and practical standpoint.

In response to the request of the European Parliament and in order to facilitate the wide distribution of this material by making it available to all scientists, jurists, physicians, administrators, technicians and university staff who are interested in such problems, the Commission issued in June 1961 a volume entitled "Legal and Administrative Problems of Protection in the Peaceful Uses of Atomic Energy". This book is on sale to the general public, the distribution being in the hands of a group of European publishers (1).

D. *Problems of Health and Safety in the Transport of Radioactive Materials and in Nuclear Marine Propulsion*

156. In July 1961 (2), the Commission published a comparative survey which it had carried out of the provisions applicable to the transport of radioactive materials in the Community. This survey aims at simplifying the implementation of the Basic Standards in the transport field and at the same time facilitating the harmonization of the relative legal provisions; the main analogies or divergencies between these various provisions are also brought out.

On the basis of this document, the success of which has not been confined to the Community countries, the Commission proposes to go into the problem of laying down regulations for health and safety in the field of transport.

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(1) "Legal and Administrative Problems of Protection in the Peaceful Uses of Atomic Energy", 1264 pages. Publishers :
Germany : A. Lutzeyer, Waldseestrasse 3/5, Baden-Baden;
France : Dalloz-Sirey, 11, rue Soufflot, Paris;
Italy : A. Giuffrè, Via Solferino 19, Milan;
Benelux and countries outside Europe : H.E. Stenfert Kroese, Pieterskerkhof 38, Leyden.

(2) "Transport of Radioactive Materials - Comparative Survey of the Relative Laws in the European Community". European Atomic Energy Community, Brussels, July 1961.

The Commission has also issued—in a provisional edition—a compendium of legislative and regulatory provisions in operation in the member countries and the United States (1) on the transport of radioactive substances.

Independently of these coordinating activities, the Directorate for Health and Safety frequently lends its services in the Community as a specialized consultant for transport operations effected through the Supply Agency or of concern to the Joint Research Centre branch establishments.

157. The first nuclear-powered merchant vessel, the American ship NS "Savannah" (2), will shortly be calling at various ports in the European Community countries, a development which has brought home to the Commission the urgency of drawing up a set of provisions to govern the entry of nuclear vessels into territorial waters and their berthing in ports so as to ensure the protection of the general public against ionizing radiations. The Commission is particularly concerned with provisions of a regulatory nature which could be applied by the Member States as part of the system of enforcement of the Basic Standards. It is considering the possibility of promoting cooperation between the national authorities in this field.

II. Background Radioactivity Monitoring

A. *General Monitoring Organization*

158. In 1961, the Commission published a new, up-to-date document on the general organization of radioactivity monitoring in the Community countries and also on the results of measurements

(1) "Standards Governing the Transport of Radioactive Materials in the European Community Countries, the United Kingdom and the United States". European Atomic Energy Community - Directorate for Health and Safety, Brussels, 28 February 1962.

(2) See chapter headed "Industry and Economy".

carried out in 1960 (1). This document, which is more complete than its predecessors, gives a survey for each of the Member States of the set-up for the monitoring and special supervision of the air, fall-out, surface water, residual water, drinking water, sea-water, soil and food chain. It sets out the administrative organization employed in each of the Member States for carrying out these various monitoring operations; it provides technical details on each of the measuring and sampling posts in Community territory and shows the 1960 results for measurements relating to three leading sectors of artificial radioactivity monitoring, i.e. radioactivity of dust suspended in the air, radioactivity of fall-out and precipitations and surface water radioactivity. The maps and diagrams which are also provided make the document easier to use.

The survey of the monitoring installations for measuring artificial radioactivity in the air has now been completed. The questionnaires have been returned to the Commission and the index-cards have been made out. This list will make it possible to form a more accurate idea of the characteristics of each measuring post and, apart from its usefulness as a handbook, contains valuable information on the nature of the calibration standards applied and the types of filter in use. In addition, it gives particulars of the methods and apparatus employed as well as an appraisement of the data obtained, particularly in respect of certain radioelements.

Visits have been made to monitoring installations in the six Community countries, thus enabling contacts to be established with the leading officials in these centres.

B. *Development of Background Radioactivity*

159. Since September 1961, the measuring posts in the Community have recorded an appreciable rise in artificial radioactivity.

(1) General Organization of Radioactivity Monitoring in the Community Countries and Results of Measurements for 1960 - P.S. 3, Euratom, The Commission - November 1961.

Up to that point, the levels observed had been so low that in some cases they were almost outside the range of the measuring appliances.

The competent authorities referred to in Article 36 of the Treaty met on two occasions during the last quarter of 1961. On a proposal of the Commission, an improvement was made in the system of exchanges of information in this field; the Commission is now advised weekly of the unadjusted measurement results obtained at certain Community posts, while a series of special measurements relating to the food chain have also been advocated.

After consultation with the 12-man group of Basic Standards experts, a reference level for the assessment of the results obtained was established in respect of iodine in milk (150 picocuries per litre per day); similarly, a definition was given of the method for determining, in the air inhaled, the maximum concentrations of radionuclides present in the atmosphere.

C. *Coordination of Measuring Methods*

160. Were all the measuring installations in the Community required to use the same apparatus and the same processes, the effect would be to hamper technical progress. The situation which now obtains in this field, moreover, antedates Euratom and is the outcome of differences in the concepts adopted by the individual States, and even by the various bodies in the same State; it is also to some extent determined by the types of equipment produced by the various national industries.

The Commission's efforts have been aimed at circulating information on the various appliances and techniques, coordinating the method of setting out the results and organizing technical consultations enabling the persons running these facilities to get acquainted and to benefit from the general pooling of practical experience. Thus in 1961, the Commission arranged numerous meetings of technicians on the various aspects of artificial radioactivity, surface water, mud and sea-water. Similar meetings are planned for 1962.

A study seminar devoted to a comparison of measuring appliances was held at the French Atomic Energy Commission's (CEA) research centre at Fontenay-aux-Roses. The main subjects discussed were the use of appliances according to their technical characteristics, evaluation of measuring results and the role of scientific studies in comparisons of measuring and sampling devices. The results of this seminar will be published in the course of 1962.

D. *Study of Filters*

161. An enquiry conducted by the Commission has shown wide differences among the filters used in radioactivity measuring devices in the Community. This lack of uniformity constitutes an obstacle to the efficient coordination of measurements and has prompted the Commission to carry out a number of special studies on the subject.

E. *Study of Background Radioactivity in the Rhine Basin*

162. The Commission has succeeded in having incorporated in its operating budget a relatively large credit for the study of radioactivity in the Rhine basin. An initial meeting of the representatives of the national authorities was held in December 1961; a detailed exchange of views on the broad lines of the programme proposed by the Commission took place at the second meeting, which was held on 9 March 1962.

The study of the radioactive pollution of international rivers is a matter of considerable importance. From this point of view the Rhine basin study is a test case and, if the results prove favourable, will be followed by other studies of international rivers such as the Meuse or the Scheldt.

III. Nuclear Plant Safety

A. *Check on Radioactive Waste Disposal Projects*

163. Pursuant to the recommendation published in the "Journal Officiel" of 21 December 1960, Belgium and Germany submitted

to the Commission a number of plans, which have been examined in accordance with the procedure laid down in Article 37 of the Treaty. These plans relate to the following reactors: FR 2 research reactor, Karlsruhe; BER research reactor of the Hahn-Meitner Institut, Berlin; FRM research reactor, Munich; "Argonaut" reactor of the SSW, Munich; PR 10 test reactor of the AEG, Großwelzheim; BR 2 research reactor, Mol; BR 3 power reactor, Mol.

The Commission has thus been able to give opinions regarding the contamination risks which might arise from the disposal of the gaseous or liquid wastes from these plants.

In addition, the following plans are under examination: plutonium laboratory of Belgonucléaire; waste-water processing plant, Mol (Belchim); uranium-processing plant, Ellweiler; plan for disposal in the North Sea of waste from the HFR reactor, Petten.

B. *Opinions on Operational Safety*

164. In the course of 1961, the Belgian Government requested two opinions on the operational safety of the BR 2 and BR 3 reactors.

In connection with these requests, the internal group on reactor safety, consisting of Euratom officials, undertook the preliminary study of the documents received; it next proceeded, with the cooperation of a group of international experts meeting specially for the purpose, to carry out the studies required. The Commission's reply to the Belgian authorities was based on the opinions expressed.

The problems raised in connection with the operational safety of reactors are extremely complex and affect many branches of science, whose representatives derive considerable benefit from an objective comparison on a collective basis of the various specialist opinions. The Commission is therefore very pleased to be able, whenever the occasion arises, to render national author-

ities desirous of making use of them the services requested in connection with studies of this type.

In addition, the Directorate for Health and Safety has participated in the evaluation study of the risks liable to arise from the SENA power plant to be constructed at Chooz.

IV. Hygiene and Medicine

A. *Aims and Resources*

165. The problems of radiation medicine and hygiene have always ranked among the Commission's foremost preoccupations. Three principal aims must be pursued, namely:

— supervision of the application of the Basic Standards in the Joint Research Centre establishments;

— development of research projects connected with health and safety;

— promotion within the Community of a branch of industrial medicine and hygiene centred on the specific field of radiations.

The Joint Centre establishments are, within the meaning of the Basic Standards, controlled areas, in which the provisions of the Basic Standards are thus applied in an exemplary manner; supervision of their application is exercised by specialized departments of the Commission.

The necessary administrative set-up for the exercise of such control has been installed and rules governing the application of the Basic Standards are in course of preparation; special attention has been paid by the Commission to the provision of safeguards for the environment of the Centre.

Moreover, health and safety constitute a meeting-point of all the various fields of science involved in the study of the preventive and protective mesures to be adopted to safeguard the health of nuclear workers and the general public; the specialties

in question may be grouped under the main heads of biology, medicine and physics.

During 1961, the situation improved as regards both the number and ability of the research workers, and close cooperation was set up between the biology department and the Directorate for Health and Safety with a view to the development of a coordinated programme, special attention being paid from the outset to the epidemiological studies which have to be carried out on persons or groups of persons who have received a dose sufficiently high to be of significance from a health and safety standpoint (persons occupationally exposed, injured workers, irradiated patients) and also to the training of specialists in radiological protection. In this connection, the Commission is planning to introduce, at technical education level, Euratom diplomas in radiation hygiene so as to promote the harmonization of existing training schemes and to facilitate exchanges of technicians within the Community.

The directives laying down the Basic Standards include a chapter headed "Fundamental Principles Governing Health Surveillance of Workers", which is subdivided into "Physical Control for Protection Against Radiation" and "Medical Control". The set-up of such a control system, while being an essential factor in the protection of workers against radiation, constitutes only one facet of the vast problem of the organization of workers' medical services.

There are at present fewer industrial accidents and occupational diseases in the nuclear industry than in any other sector. It is of paramount importance that this state of affairs should be maintained, especially when many small users of isotopes and apparatus emitting radiations—and their numbers are steadily increasing—become responsible for the protection of themselves and their personnel.

The Commission is particularly alive to this aspect of the problem and is actively pursuing its efforts to secure the introduction at Community level (it is participating in the work of the EEC and the ECSC in this field) of a branch of industrial medi-

cine specially designed for the nuclear sector, based on the fundamental principles underlying the Basic Standards.

B. *Stresa Conference*

166. On the important question of health surveillance of workers, the Commission organized a conference at Stresa in May 1961 for the purpose of comparing notes on the experience acquired in connection with the medical supervision of workers exposed to radiological hazards.

This conference was attended by about 200 delegates from both Member and non-Member States as well as from the major international agencies; 20 speakers read papers on the general principles of health surveillance, the medical and psychological criteria for pre-employment examinations, the importance of blood tests and statistical evaluation, the assessment of toxicological data, the organization of medical control services and the medical control measures to be taken in cases of over-exposure.

All these reports sparked off wide-ranging discussions giving rise to conclusions from which it was possible to single out the principles of indisputable value not only for the Commission, but also for the doctors responsible for the medical control services, factory inspection physicians, radiologists and public health officers.

The Official Proceedings of the Conference, which were translated into the four Community languages and into English, will be published in 1962. This document contains a great deal of the information that the Commission intended to make available to doctors specializing in radiological protection problems and will, at all events temporarily, serve as a substitute for the brochure requested by the European Parliament, mention of which has been made in previous Reports.

During 1962 a further conference is to be held to cover other problems connected with medical supervision. Among the subjects to be dealt with are toxicological analyses, the organization of medical aid in the event of accidents and the qualifications

required for the approved medical practitioners referred to in the Basic Standards.

C. *Exposure Record Card*

167. The exposure record card, which forms one of the basic components of a nuclear worker's medical file, has been issued to the Member States and distributed in a number of nuclear centres or institutes for the purpose of establishing its technical worth.

The card will thus be instrumental in bringing about a certain measure of uniformity in medical files in the Community countries, as provided for by the Basic Standards.

D. *Dosimetry*

168. Studies now being carried out on dosimetry problems in connection with radiations to which workers are liable to be exposed will result in a more thorough knowledge of the methods employed, the coordination of which is desirable not only in the Joint Centre establishments but also in the large-scale nuclear power plants.

E. *Surface Contamination*

169. The Commission has drawn up an initial study programme on the subject of surface contamination. A considerable amount of documentary material has already been collected for the preliminary work, which has been commenced in cooperation with the Committee of Experts on the Basic Standards.

F. *Food Chain Contamination*

170. In 1961, the Commission signed a contract of association with the French Atomic Energy Commission (CEA) for a study aimed at determining the food-chain contamination levels. The principal cause of internal human irradiation is the consumption of food contaminated by radionuclides originating either from fall-out and precipitations or from fission products released in the atmosphere and in surface waters.

With the aid of the latest scientific information available and by means of an analysis and synthesis of diets and the biological cycle of nuclides, this study will make it possible to arrive at a more accurate idea of the extent of the contamination hazard to which the populations of the Community are exposed through the presence of certain fission products.

The contract, which came into force on 1 October 1961, provides for the enlistment of the aid of national institutions equipped to play an effective part in the execution of the proposed programme.

The Commission also participated in the work which was carried out at the FAO headquarters in Rome during 1961 and led to the preparation of a handbook setting out the principles to be adopted in the effective surveillance of radioactivity in foodstuffs and in agriculture.

The Commission further took part in the Rome Congress on Genetics in 1961 and in colloquies organized jointly by the FAO, the WHO and the IAEA for the study of questions relating to the suitability for consumption of irradiated foodstuffs (Brussels) and the problems raised in agriculture and public health by radioactive contamination in normal or exceptional conditions (The Hague).

V. Social Problems

171. The social problems which fall within the purview of Health and Safety are being dealt with in a wider context in cooperation with the other two Communities.

The Commission has participated in the drafting of the chapters which appear in the synoptic table of the various social security systems applicable in cases of industrial accidents and occupational diseases.

It has also, together with the Joint Statistics Office, prepared headings specially designed and adapted to meet the obligations

arising out of Articles 30-39 of the Treaty and also to ensure compliance with the Basic Standards.

A special problem which is now being studied is that of the prevention of the occupational irradiation hazard. In this connection, it is planned to hold in the course of 1962 study sessions on the prevention of the occupational irradiation hazard, with particular reference to concrete measures or the installation of special devices at the place of work which may contribute to the prevention of industrial accidents and occupational diseases.

Finally, at the international exhibition of methods of protection against fire, radiation and accidents ("Interschutz") held at Cologne from 23 June to 2 July 1961, the Euratom stand displayed diagrams and charts illustrating the activities undertaken by the Commission in the field of health and safety.

VI. Relations with non-Community Countries and International Organizations

172. While the cooperation already initiated with a number of non-Community countries has been continued, the Commission's activities in the health and safety field called for the establishment of further contacts.

In particular, representatives of the Commission and the Swiss Government met several times in Berne and Brussels to examine the entire range of health and safety problems of common interest.

As part of the routine cooperation provided for under the United Kingdom/Euratom Agreement, a meeting took place in London around the middle of the year between Euratom representatives and representatives of various British health and safety bodies.

In the context of United States/Euratom cooperation, nuclear plant safety experts of the Atomic Energy Commission collaborated with the Commission on several occasions in connection with safety assessments carried out by Euratom.

There was further cooperation with the pricipal international organizations in the various fields of health and safety, and in particular with the IAEA, the OECD, the ILO and the WHO on problems relating to the Basic Standards, radioactive waste disposal, radioactivity control, specific standards for workers, etc. (see chapter headed "External relations").

CHAPTER V

SAFEGUARDS AND CONTROLS

IMPLEMENTATION OF NUCLEAR SAFEGUARDS IN LINE WITH THE METHODS AND PROCEDURES LAID DOWN BY THE COMMISSION — INCREASE IN THE NUMBER OF PLANTS ON WHICH STATEMENTS MUST BE SUBMITTED UNDER THE TERMS OF REGULATIONS 7 AND 8 — PROPOSALS DESIGNED TO SUPPLEMENT REGULATION 8 — FULFILMENT OF CONTROL COMMITMENTS UNDERTAKEN UNDER THE AGREEMENTS FOR COOPERATION PREVIOUSLY CONCLUDED WITH NON-COMMUNITY COUNTRIES

173. The years 1958, 1959 and 1960 saw the gradual institution of the control system. In 1958 the Commission paved the way for this development, an agreement being concluded with the US recognizing the Community's competence in this field.

In 1959 and 1960 the following regulations were enacted and put into effect:

a) Regulation 7 defining the basic technical characteristics of each plant of which declaration is to be made to the Commission;

b) Regulation 8 on materials' accountability, governing the periodical declarations to be submitted to the Commission by the various enterprises concerning stocks and movements of ores, source materials and special fissile materials;

c) Regulation 9 defining the concentrations of ores, which has facilitated the implementation of the provisions of Regulation 8 relating to these materials. Inspection procedures and methods have been elaborated and initial inspections carried out.

174. In 1961 the Commission's activities in the field of safeguards and controls were mainly directed at ensuring the smooth implementation of this system.

To this end the Commission also

— ensured that an overall survey be established and kept up-to-date on the use of nuclear materials, i.e. the characteristics of existing plants and their functions;

— supervised the application of the existing supply regulations: to the effect that the Supply Agency should be kept informed of conversion contracts and the Commission notified of the various commitments existing between enterprises, Supply Agency contracts, export licences, etc.;

— ensured fulfilment of the outside commitments undertaken by the Community, especially with regard to the materials and equipment supplied for research projects and power plants under the Euratom/US Agreement.

175. Due to the dimensions assumed by nuclear research and the expansion of the Community's nuclear industry, the Commission's control activities extended to a larger network of plants in 1961, as can be seen from the following table:

Number of installations (1) on which the declarations required by Regulations 7 and 8 were submitted

	1960	1961	1962
Regulation 7 (2)	59	72	83
Regulation 8 (2)	56	111	127

(1) As of 31 March for 1960 and 1961 and 28 february for 1962.
(2) Mining enterprises are not subject to the terms of Regulation 7, since they are not referred to in Para. 1 of Article 78 of the Treaty.

The plants of which the basic technical characteristics have been notified to the Commission (Regulation 7) break down as follows:

Breakdown by branch of industry of the installations of which the basic technical characteristics have been communicated

	Germany		Belgium		France		Italy		Netherlands		Community	
	61	62	61	62	61	62	61	62	61	62	61	62
Manufacture of concentrates	1	1	1	1	4	4	1	1	—	—	7	7
Fuel fabrication	1	1	1	1	3	4	—	—	—	—	5	6
Fuel element fabrication	1	1	2	3	3	3	—	—	—	—	6	7
Reactors (1)	11	12	6	6	16	18	7	8	2	3	42	47
Irradiated fuel reprocessing	—	—	—	—	1	1	—	—	—	—	1	1
Laboratories (2)	3	3	1	2	3	5	4	5	—	—	11	15
TOTAL	17	18	11	13	30	35	12	14	2	3	72	83

As regards the implementation of *Regulation 8*, the situation at the end of 1961 was as follows:

a) Stocks and movements *within* the Community:

— ores: 10 enterprises submit quarterly statements to the Commission relating to the production and stocks of 40 mines;

— source materials and special fissile materials: 44 enterprises submit to the Commission monthly balances and inventories for 86 installations.

(1) The term "reactors" covers power and research reactors as well as subcritical assemblies.

(2) Physical and chemical laboratories using source materials or special fissile materials for research purposes. A separate statement is submitted for each reactor possessed by a research centre.

b) Exports to and imports from *non-member countries:*

In 1961 a total of 239 declarations relating to import and export transactions with non-member countries was submitted to the Commission by 25 enterprises, the breakdown being as follows:

	Imports	Exports
— Natural uranium	45	24
— Thorium	22	65
— Special fissile materials	72	11
Total	139	100

The following breakdown shows the geographical distribution within the Community of the enterprises, establishments and installations concerned.

	Germany				Belgium				France				Italy				Netherlands				Community			
	61		62		61		62		61		62		61		62		61		62		61		62	
Enterprises (1)	12		15		7		7		16		17		7		10		6		6		48		55	
Establishments (1)	13		16		8		9		53		57		11		15		6		6		91		103	
Installations (1)																								
Mines		—		1		1		—		35		39		1		1		—		—		37		41
Manufacture of concentrates		1		1		1		—		4		4		1		1		—		—		7		6
Fuel fabrication		1		1		1		1		5		5		—		—		—		—		7		7
Fuel element fabrication		1		1		2		1		2		2		—		—		—		—		5		4
Reactors		9		10		4		6		15		16		6		10		2		3		36		45
Irradiated fuel reprocessing		—		—		—		—		1		1		—		—		—		—		1		1
Laboratories		3		4		2		2		5		6		3		6		5		5		18		23
	15		18		11		10		67		73		11		18		7		8		111		127	

(1) An enterprise may comprise several establishments, some of which may themselves contain a number of installations, e.g., a reactor and laboratories or several workshops.

176. Throughout the Community enterprises have met their control commitments and in several cases the national authorities have considerably helped the Commission in its work.

The Commission has made every effort to ensure compliance on the part of the enterprises with the deadlines laid down for the submission of declarations under Regulations 7 and 8. Declarations were completed or subjected to on-the-spot checks with the aid of the inspection teams sent to the various installations. The introduction of the simplified supply procedure also made it possible for these inspections to cover contracts communicated to the Supply Agency by the enterprises. Since May 1960, when the system was launched, 23 inspections have been carried out, 10 in industrial plants and 13 in research installations.

The Commission has also applied Regulations 7 and 8 to the Euratom Joint Research Centre. At the end of 1961 the Centre was inspected for the first time, in line with the procedure, discussed in the last General Report, covering installations which are not run by the Commission.

177. The Commission has made further headway in its task of removing certain of the stumbling-blocks encountered in connection with the application of Regulations 7 and 8 at certain plants. To this end, it elaborated a draft provision designed to supplement Regulation 8 with reference to installations the main activity of which is the production or extraction of special fissile materials required for defence purposes. This provision, aimed at striking the necessary balance between the defence requirements of the various states and compliance with the terms of the Treaty, is to be submitted to the Council of Ministers for approval under Article 79 of the Treaty. When and if the Council gives its approval, the Commission will make the corresponding amendments to Regulation 7.

178. Work under the Euratom/US agreement progressed in the normal way.

In 1961 the system of prior approval provided for continued to be applied to projects involving the use of equipment or

materials imported under the Agreement and fresh exchanges of views on technical problems were arranged with the AEC with a view to benefiting from this body's experience in the control of nuclear materials in the US.

The experience gained by the Commission in the institution and running of the Euratom control system, which has been in existence since 1959, proved of considerable assistance in the drafting of the European Agency's Control Regulations.

CHAPTER VI

EXTERNAL RELATIONS

DEVELOPMENT OF AGREEMENTS FOR COOPERATION WITH THE UNITED STATES, THE UNITED KINGDOM AND CANADA — NEW AGREEMENTS (BRAZIL AND ARGENTINA) — DEVELOPMENT OF EXISTING RELATIONS WITH OTHER NON-MEMBER STATES. POSSIBILITIES OF COOPERATION WITH NEWLY-DEVELOPING COUNTRIES IN THE ATOMS-FOR-PEACE FIELD — EXTENSION OF THE RELATIONS BETWEEN THE COMMUNITY AND OTHER INTERNATIONAL ORGANIZATIONS

179. Alive to the significance attached by the Treaty to this facet of the Community's functions, the Commission has, in the fourth year of its existence, proved particularly active in promoting and consolidating links with outside bodies in line with the pattern established in Chapter X of the Treaty.

As regards Euratom's relations with non-member states, there is an increasingly marked division into two categories. On the one hand, Euratom maintains relations with countries which rank among the most advanced in nuclear science and technology; in the first years of its existence the Community concluded agreements for cooperation with these countries and now that the Commission has the establishments of the Joint Research Centre at its disposal, the implementation of these agreements is proceeding with a genuine exchange of experience and information on a basis of equality.

While the technical contacts were thus developing satisfactorily the Commission took particular care that the Agreement for Cooperation between Euratom and the United States was adapted in line with the trends of the Community's requirements.

On the other hand, mention must be made of the relations with countries which have recently evinced interest in the peaceful uses of nuclear energy.

The Community has responded to the repeated appeals from the European Parliament and the Member States to enter into close cooperation with these countries in all the sectors of nuclear energy in which they desire it and in which such cooperation has prospects of leading to positive results. The Commission is of the opinion that—without wishing to ignore the commercial interests associated with the supply of reactors—it is in a position to contribute in various fields to the provision of aid to the newly developing countries—aid which all the Member States of the Community likewise consider themselves obliged to furnish. For these reasons the Commission has announced on numerous occasions that it is ready to discuss with the countries concerned all suitable forms of cooperation.

By the same token, the Commission wishes to recall the recent conclusion of a framework agreement between Euratom and Brazil, in respect of which it considers itself in duty bound to enable the Community as a whole to benefit by the initiative of one of the Member States.

Particular importance must also be attached to the development of relations between Euratom and the international organizations which are working in the sphere of nuclear science, or whose activities overlap in certain sectors with those of the Community. It is indisputably vital that standardization, e.g. as regards measures in the field of health and safety or the carriage of radioactive materials, should be carried out on the broadest possible international basis. The Euratom Commission has consequently continued its efforts to establish the necessary bonds with the international organizations concerned, insofar as this had not been done in the preceding years.

Finally, certain countries have recently expressed the desire to be admitted to, or associated with, the European Communities,

and the Commission is now devoting its full attention to the problems to which this has given rise.

In particular, Euratom has welcomed with interest and satisfaction the request officially submitted by Great Britain on 5 March 1962 for the opening of negotiations with a view to its possible membership of Euratom, as well as Denmark's request to the same effect, which was officially submitted on 16 March 1962.

I. Relations with non-Member States

A. *Countries with Which Euratom Has Concluded Agreements for Cooperation*

a) *The United States*

180. The progress achieved in the implementation of the Agreement for Cooperation between Euratom and the United States concluded in 1958, which has already been supplemented by an annexe signed in 1960, in conjunction with the necessity to draw up long-term plans, has once again induced the parties to undertake a joint review of the texts governing the cooperation between them.

The successful negotiations conducted during the autumn of 1961 have led to the drafting of various amendments which relate both to the original Cooperation Agreement and to the annexe of 1960.

These texts, which were submitted to the Council on 5 March 1962, are due to be signed shortly. They will then be submitted to the United States Congress for ratification.

The principal object in amending the Cooperation Agreement is to create the possibility of hiring—and no longer exclusively purchasing—the fissile materials needed to fuel the power reactors which are to be built under the Joint Euratom/United States Programme.

Other changes will also be made in the Agreement; most of these are merely of a formal nature. Mention should, however, be

made of the new draft of the provisions concerning industrial property, by virtue of which the scope of the Commission's commitments is limited to patents related to the field of nuclear energy; this is in fact an advantage which will undoubtedly be appreciated by both persons and enterprises within the Community.

It will be recalled that under the terms of the Cooperation Agreement the United States had undertaken to supply 30 metric tons of uranium U-235 for the implementation of the Joint Programme; the annexe subsequently made it possible for a comparatively small quantity of this tonnage to be used in certain research projects conducted by the Commission or in the Member States outside the framework of the Joint Programme; the objects of this research work were restrictively summarized in the codicil.

The amendments to the annexe have modified these terms on a number of important points.

In particular, the supply to the Community of the 30 metric tons of U-235 provided for in the 1958 Agreement is no longer bound exclusively to the implementation of the Joint Programme as defined in that Agreement. The quantities which have not been used for the implementation of the Joint Programme by June 1962 will not be lost to the Community; they will remain at its disposal during the coming years and can be employed either in the Commission's own research projects or for supply to persons and enterprises in the Community who wish to build reactors outside the framework of the Joint Programme.

Another provision in the new annexe which is of special importance for the industries of the Six envisages the manufacture within the Community of fuel elements for export. The Community will henceforth be able to import U-235 from the United States for processing into fuel elements which will subsequently be exported to countries outside the Community. In this connection it should be emphasized that particularly advantageous terms were obtained from the United States. Mention must likewise be made of the clause by virtue of which it will henceforth be possible for fissile elements imported from the United States to undergo chemical processing in the Community.

b) *The United Kingdom*

181. In application of the 1959 framework agreement the cooperation between Euratom and the United Kingdom has been continued and in certain respects considerably expanded.

In particular, visits on both sides and conferences between the parties have enabled wider exchanges of information to be effected. During the past year these exchanges have related mainly to health and safety problems, reactor physics, various metallurgical questions and fast reactors.

Personnel exchanges have likewise been amplified to cover new fields of activity, especially fusion research, irradiation channels and heat-exchange.

As a result there has been a substantial increase in the number of technicians assigned—generally for periods of several months—to the installations of both parties; in this connection it must also be mentioned that a British team participated in the start-up of the BR 2 reactor at Mol. Furthermore, under the Agreement the United Kingdom has supplied small quantities of special fissile materials to the research centres of the six countries.

c) *Canada*

182. Satisfactory headway was made in the course of 1961 with the implementation of the technical Agreement between Euratom and Atomic Energy of Canada Ltd., concluded on 6 October 1959. It will be remembered that the Joint Programme for Research and Development, which forms the main object of this Agreement, bears on the study of the heavy water-moderated, organic-liquid-cooled reactor type (i.e. Euratom's ORGEL programme, which corresponds to the OCDRE programme of Atomic Energy of Canada Ltd.).

The work carried out by both parties during the past year has given rise to an extremely valuable cross-fertilization of ideas which has dearly brought out the vital importance of the activities carried out under the ORGEL programme. Since the USAEC, on its part, cooperates with Atomic Energy of Canada Ltd. in the same field, the desirability of bringing about similar exchanges

of information with the American Commission soon became apparent. These exchanges, which are effected on a basis of full reciprocity, are now proceeding to the satisfaction of both parties.

d) *Brazil*

183. The Cooperation Agreement previously negotiated between Euratom and Brazil was signed at Brasilia on 9 June 1961.

e) *Argentina*

184. The negotiations between Euratom and Argentina were likewise brought to a successful conclusion in the course of the past year. A cooperation agreement similar in content to that concluded with Brazil will shortly be signed by the two parties.

B. *Other Countries*

185. In November 1961 the Euratom Commission, which had visited Copenhagen in February of that year, received a delegation from the Danish Government and the Danish Commission for Atomic Energy. The Danish delegation, which included Professor Niels Bohr, Chairman of the Danish Commission for Atomic Energy, was headed by Mr. J. Bomholt, Minister for Cultural Affairs. After a series of discussions at the Commission's headquarters in Brussels, the Danish group paid successive visits to the establishments of the Euratom Joint Research Centre at Geel and Ispra and to the laboratories at Saluggia, which form part of the Ispra establishment.

In addition, following the contacts which had previously been initiated at Brussels, a delegation of Indian technicians headed by Dr. Bhabha, Chairman of the Indian Atomic Energy Commission, visited Ispra and Saluggia.

Finally, in December 1961 Dr. U.W. Hochstrasser, the delegate of the Swiss Federal Council for Atomic Affairs and Chairman of the Federal Atomic Energy Commission, was received by the Commission at Brussels and Geel.

At the invitation of the Japanese Government, the Commission paid an official visit to Japan in November 1961.

On this occasion the Commission met Mr. Miki, Minister Responsible for Atomic Affairs and Chairman of the Japanese Atomic Energy Commission, as well as the members of that body; visits were also paid to the Japanese Institute for Nuclear Research and to a number of industrial plants.

The questions raised in the course of the Euratom Commission's tour aroused keen interest on both sides, and the Japanese authorities voiced the wish that an agreement for cooperation might be concluded between Euratom and Japan on the peaceful applications of nuclear energy.

The members of the Commission, welcoming this overture, stated that the necessary steps would be taken to set in motion the procedure provided for by the Treaty.

C. *Missions Accredited to Euratom*

186. The Republic of South Africa, too, has now accredited a mission to the Community, thereby increasing to eleven the number of non-member states maintaining diplomatic relations with Euratom. In addition, Brazil, Argentina, the Ivory Coast, Spain and Portugal have set in train the necessary formalities with a view to accrediting diplomatic missions to the Communities.

D. *Relations with Newly-Developing Countries*

187. The Commission has, from the very outset, displayed a keen grasp of the problems faced by the newly-developing countries, especially the African states; consequently it welcomed the recommendation adopted on 26 June 1961 by the Euro-African Parliamentary Conference which opens the way for extending the future association of various African countries with the European Economic Community to include the European Coal and Steel Community and Euratom. The Commission is therefore keeping an alert watch on the discussions now under way between these countries and the EEC.

The Euratom Commission has likewise taken an active part —together with the EEC Commission—in the drafting of proposals, recently submitted to the Common Market and Euratom Councils of Ministers for the creation of a Joint Development Institute.

This means that, if the newly-developing countries so desire, Euratom will gladly embark on any realistic scheme of cooperation in the atoms-for-peace field. Among the areas in which such collaboration might be envisaged, the Commission has in mind primarily certain uses of radioactive isotopes, e.g. in medicine and agriculture, mining prospecting and the study of the conditions in which nuclear power plants might operate in the countries concerned.

E. *Euratom Training Courses*

188. In this connection it is worthy of note that in the period 1961-1962 the Commission allotted a not inconsiderable number of places on its courses to trainees who are nationals of non-member countries, for which purpose it applied the same criteria as for the allocation of places to nationals of the Member States. Since all the applications for places were treated on a basis of complete equality, the Commission's choice was governed solely by the scientific qualifications of the applicants.

II. Relations with International Organizations

A. *Organization for Economic Cooperation and Development (OECD)*

189. In accordance with Supplementary Protocol N° 1 to the Convention relating to the Organization for Economic Cooperation and Development, which came into force on 30 September 1961, the European Atomic Energy Community is represented in the OECD, and the Euratom Commission takes part in the activities of that organization. As stipulated in the new Article 21 of the Statute of the European Nuclear Energy Agency (ENEA),

the provisions of the above-mentioned protocol apply both to Euratom representation in the Agency and its Steering Committee and to the Euratom Commission's participation in the work carried out by the Agency and its Steering Committee. Concrete expression has thus been given to the collaboration which had already been instituted between Euratom and ENEA before the signing of the OECD Convention. In the course of the past twelve months this collaboration has been further developed and intensified.

Substantial progress has been made in the implementation of the Dragon Project Agreement, signed in Paris on 23 March 1959, both as regards the construction of the reactor and in the sphere of research (see the chapter on Research).

The fact has now emerged, however, that in order to derive the full benefit from the work and investments effected to date, it will be necessary to prolong the scheme beyond the five-year span originally provided for. With this end in view, a new research programme amounting to an extension of the Agreement to 1967 has been put before the signatories.

B. *International Atomic Energy Agency (IAEA)*

190. There has been no change during the past year in the relations between Euratom and the International Atomic Energy Agency. The contacts maintained between the various Euratom departments and the Secretariat of the Agency in the course of their work have been actively pursued; as in previous years, the Commission, at the invitation of the Board of Governors, was represented by an observer at the fifth session of the Agency's General Conference, held in Vienna from 26 September to 6 October 1961.

Nevertheless, the unremitting hostility manifested by certain non-member countries towards the Community, which despite all evidence to the contrary is charged with pursuing military ends, has acted as a stumbling-block to the establishment of formal relations between Euratom and the Agency.

The Commission has already had occasion to deplore this state of affairs, since the placing of relations between the Community

and the Agency on a formal footing could not fail to benefit both parties.

C. *United Nations Food and Agricultural Organization (FAO)*

191. Relations were established some time ago between Euratom's departments and those of the FAO on various technical matters; these links have gradually been reinforced, with the result that the Commission and the FAO soon found it necessary to put them on an official basis. In December 1961, with this end in view, there was an exchange of letters between the parties in which the content and form of the future cooperation were defined. The Commission and the FAO have agreed to widen their liaison in the following areas:

— the use of radioactive isotopes and radiations in research on, and the processing and production of, foodstuffs and agricultural produce;

— the study of the movement, behaviour and concentration of radioactive nuclides in soil, water, plants, animals and foodstuffs, and the study of the implications for human alimentation.

Furthermore, during 1961 the Commission was associated with the work carried out at the FAO headquarters, which resulted in the compilation of a manual on the principles to be adopted for effective supervision of radioactivity in food and agriculture.

D. *International Labour Organization (ILO) and World Health Organization (WHO)*

192. Cooperation with these two organizations has been continued, particularly in the various sectors of health and safety (problems relating to Basic Standards, the disposal of radioactive waste, the monitoring of environmental contamination, specific standards for nuclear workers, etc.).

The Commission has also taken part in the colloquies organized jointly by the FAO, WHO and IAEA on the question of the extent to which irradiated foods remain fit for consumption

(Brussels) and on the problems raised in the agricultural and public-health sectors by radioactive contamination in normal or exceptional conditions (The Hague).

E. *Council of Europe*

193. Under the arrangements arrived at in 1959, cooperation between Euratom and the Council of Europe has continued in a highly satisfactory manner.

F. *Inter-American Nuclear Energy Commission (IANEC)*

194. The Commission has maintained with the Inter-American Nuclear Energy Commission the contacts which were established in 1960.

III. The Application of Article 104 of the Treaty

195. In accordance with a prior consultation procedure, the Commission was apprised of a projected exchange of letters between the Italian Atomic Energy Commission (CNEN) and the Greek Atomic Energy Commission; it was agreed on this occasion that the information exchanged in the course of this correspondence would be made available to Euratom. The first body of information to derive from the implementation of agreements concluded on similar terms in previous years has been conveyed to the Commission, which in turn has passed it on to all the Member States.

CHAPTER VII

THE INSTITUTIONS OF THE COMMUNITY

EUROPEAN PARLIAMENT — COUNCIL OF MINISTERS — COMMISSION — COURT OF JUSTICE — ECONOMIC AND SOCIAL COMMITTEE — SCIENTIFIC AND TECHNICAL COMMITTEE — JOINT SERVICES — COORDINATION OF ENERGY POLICIES

The European Parliament

196. During the period under review the European Parliament held eight plenary sessions. In addition, it organized a conference with the parliaments of a number of African States and Madagascar and participated in a joint session with the Consultative Assembly of the Council of Europe.

During the *May Session,* the Parliament made preparations for the Euro-African Parliamentary Conference and heard a report by the President of the High Authority on the occasion of the presentation of the 9th General Report of the ECSC.

197. The *Conference of June 1961,* attended by the members of the European Parliament and by representatives of the parliaments of the African States and Madagascar, had been organized as an arena for the discussion of the problems raised by the renewal of the association of these countries with the EEC. The Conference recommended that the governments and institutions of the Community should consider extending the future association to the EEC and Euratom.

198. The salient features of the *June session* were a review by the President of the Commission on the occasion of the presentation

of Euratom's 4th General Report, a political debate and a discussion on the European University.

The political debate closed with a resolution in which the Parliament expressed the opinion that the periodic meetings of the heads of Governments and Foreign Ministers would help to make a step in the direction of European integration. Provision would, however, have to be made for the participation of the Community Executives in any meetings of this nature which might, without encroaching on the competence either of the Communities or their institutions, broach questions relating to the fulfilment of their tasks. These meetings should likewise assist in such fields as the holding of European elections on the basis of universal suffrage, the creation of a unified Executive and to the foundation of the European University. The discussion held on the last-mentioned subject led to the adoption of a resolution to the effect that the University should be created within the framework of the Community and with the collaboration of its institutions.

199. In *September* the European Parliament met in an *extraordinary session* in order to consider the agreement on the association of Greece with the EEC and Euratom's draft supplementary research and investment budget for the financial year 1961. The Parliament approved the supplementary budget, the object of which is to open the way for Euratom participation in a number of power reactor projects.

200. Also held in September was the *joint session* of the members of the Council of Europe's Consultative Assembly and the European Parliament. This session was devoted to a debate on the prospects for widening the framework of the EEC, with particular reference to Britain's application for membership.

In the course of the debate, the President of the Euratom Commission acquainted the members of the Consultative Assembly with the broad outline of the Community's activities. He also defines the Commission's standpoint with regard to Britain's possible membership of Euratom.

201. The *October session* was devoted primarily to a debate on Euratom. In the light of two reports issued respectively by the Research and Culture Committee and the Health and Safety Committee, the Parliament discussed the Community's activities in the fields of research and training, dissemination of information, health protection, safeguards and controls and insurance against nuclear hazards. In the resolutions adopted in closing the debates, the Parliament expressed its approval of the efforts made by the Commission.

In the course of the same session, the Parliament made its recommendations concerning the Dutch Government's draft convention on the setting up of a Council of European Communities and a European High Commission, the draft statutes pertaining to personnel and Community tax, and the draft directives relating to free access to specialized employment in the field of nuclear energy.

202. The annual colloquy with the Councils took place during the *November session.* View were exchanged on the transition to the second stage of the Common Market and the association of overseas countries.

The Parliament also discussed the draft budgets of the Community. In the resolution adopted at the end of the debate, the Parliament declared that the draft working budgets of the EEC and Euratom, and the Euratom research and investment budget as drawn up by the Councils, did not take sufficient account of the importance and urgency of the numerous tasks confronting the Commissions in 1962.

203. The agenda for the *December session* provided for a political debate and a debate on the European University.

The Parliament expressed its opinion on the proposed treaty for the establishment of a European Union. It put forward a number of recommendations relating mainly to certain institutions of the Union for which provision is made in the draft treaty.

In a resolution on the University, the Parliament regretted that the governments were ignoring the proposals formulated by the Euratom Commission, the Interim Committee and the Parliament, and pressed for the continuance of negotiations for the setting up of the University within the Community framework.

Another signal feature of the December session was a speech by President Hirsch, who, addressing the Parliament for the last time before leaving office, stressed the importance of an equitable two-way exchange of views between the Council of Ministers and the Commissions.

204. The *January session* was marked by a discussion of the political and institutional facets of Community membership and association on the part of certain European countries, as well as by a debate on energy policy. Furthermore, the Parliament adopted a recommendation on the revision of annexes I and III of the Basic Standards proposed by the Commission.

205. The debate on energy policy was resumed during the *February session* and closed with the adoption of a resolution stressing the role of atomic power as a factor of great significance to energy policy and calling for the construction of nuclear power plants on an experimental and industrial scale.

In the course of this session, the Parliament heard a statement by President Chatenet on the policy of Euratom. The President of the Commission, emphasizing the importance of Euratom's programme as a complement to the various national nuclear research and development programmes, drew attention to the part played by Euratom in the creation of the new Europe as a political entity.

The Council of Ministers

The Council took a number of decisions enabling the Commission to carry on with and amplify the range of its activities.

40th Session (3-4 July 1961)

206. The Council met under the presidency of Mr. Balke, German Federal Minister for Atomic Affairs.

Acting on the Commission's proposal, the Council drew up a draft supplementary research and investment budget in which provision is made for the appropriation of 32 million EMA units of account for Community participation in power reactors, as a budgetary commitment against the 215 million units allocated for the Community's first five-year programme; of this amount, 19 million units are for use in the financial year 1961. In addition, the Council amended Annex V of the Treaty in order to widen the selection of reactor types eligible for Community participation. Both these decisions were taken by qualified majority vote.

This draft supplementary budget was transmitted to the Parliament.

The Council of Ministers took due note of the submission by the Member States of the Community, pursuant to Article 70 of the Treaty, of reports on the development of ore prospecting and production, the probable reserves and the actual or projected investments in 1959. The Commission refrained from making any recommendations for this financial year.

41st Session (24-25 July 1961)

207. The Council met under the presidency of Mr. Mueller Armack, Under-Secretary of State at the German Federal Ministry of Economic Affairs.

It adopted the Financial Regulations governing the establishment and implementation of the Community's research and investment budget and the responsibility of the pay-commissioners and accountants.

42nd Session (25, 26 and 27 September 1961)

208. The Council met under the presidency of Mueller Armack and laid down the Euratom supplementary research and investment budget for the 1961 financial year.

43rd Session (23, 24 and 25 October 1961)

209. The Council met under the presidency of Mr. S. Balke.

It approved the resumption of the negotiations with the United States, the object of which is to have certain amendments made to the Agreement for Cooperation between the Community and the USA.

After the Commission had again reminded the Council of Ministers of the need for adopting, in each of the Member States and with the minimum delay, all legislative, regulatory and administrative measures calculated to ensure compliance with the Basic Standards laid down in the Council's directives of 2 February 1959, the Council engaged in a thorough-going exchange of views on this subject. The governments concerned were recommended to take all necessary steps to settle this matter as soon as possible.

The Council proceeded to draw up the draft working budget and the draft research and investment budget for the financial year 1962. In addition, it approved the German, Italian and Dutch texts of the Financial Regulations governing the establishment and implementation of the research and investment budget and the responsibility of the pay-commissioners and accountants (Article 183 a and c of the Treaty).

44th Session (13, 14 and 15 November 1961)

210. The Council met under the presidency of Mr. Mueller Armack.

It approved the text of the Agreement for Cooperation between the Community and the Argentine Government as drawn up during the Commission's negotiations with that Government.

Commissioner Krekeler reported to the Council on the results of the official visit which the President of the Commission paid to Japan from 2 to 8 November 1961 together with Commissioners Krekeler and Sassen.

45th Session (4 and 5 December 1961)

211. The Council met under the presidency of Mr. Mueller Armack.

It laid down the working budget and the research and investment budget for the financial year 1962.

47th Session (5 and 6 February 1962)

212. The Council met under the presidency of Mr. Maurice Couve de Murville, the French Foreign Minister.

It discharged the Commission of responsibility in respect of its implementation of the 1959 budgets.

48th Session (5, 6 and 7 March 1962)

213. The Council met under the presidency of Mr. Pierre Guillaumat, "Ministre Délégué" to the Premier of the French Republic.

It unanimously approved the draft amendment to the Euratom/United States Agreement for Cooperation and the draft amendment to the Supplementary Agreement signed on 11 June 1960.

The Council gave its approval, in the form of directives, to a revised version of Annexes 1 and 3 of the directives enacted on 2 February 1959, which established the Basic Standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiations.

At the suggestion of the Commission, the Council also approved a draft directive on free access to specialized employment in the nuclear field.

The Council appointed Prof. Louis Bugnard and Mr. Robert Stumper as members of the Scientific and Technical Committee to succeed Prof. Pierre Auger and Mr. Raymond Kieffer respectively.

In view of the expiry on 1 January 1962 of the Agreement of 22 December 1958 establishing a common customs tariff for

the products enumerated in list A2 of Annex IV to the Treaty, the Council of Ministers, in a joint session with the competent Council of the EEC, fixed the new customs duties to be applied during the coming years to nuclear reactors, their components and spare parts, fuel elements, deuterium and its compounds (1).

Other Activities of the Council

214. In addition to the above-mentioned activities, the Council studied a range of questions either awaiting decisions or requiring investigation.

Thus, during the 41st Session (24-25 July 1961) an exchange of views took place on the Dutch Government's proposal for revising the Rome Treaties by adopting a Convention which would institute a single Council for the European Communities and a single "European High Commission", the latter superseding the High Authority and the EEC and Euratom Commissions. At the close of this discussion the Council agreed to refer this proposal to the European Parliament and the EEC and Euratom Commissions.

In view of subsequent favourable reception by the European Parliament and the two Commissions, the matter was brought up again at the Council's 44th Session (13, 14 and 15 November 1961).

It was decided to resume the examination of this proposal in 1962.

The ordinance establishing the statute of service for officials and the conditions of employment applicable to "other employees" of the Brussels Communities, together with the ordinance on the imposition of a Community tax, was enacted by the Council during its 46th Session (18, 19 and 20 December 1961), as a result of which these ordinances were able to enter into force on 1 January 1962.

(1) See the Chapter on "Industry and Economy" (sub-chapter III — The Nuclear Common Market).

On numerous occasions the Council has held exchanges of views on the problems entailed in working out a supplementary convention to the Paris Convention on third-party liability in respect of damage caused by nuclear accidents. Once it comes into force, this convention will have to guarantee to victims of nuclear accidents compensation in excess of the ceiling fixed by the Paris Convention.

The articles of association of the Société d'Energie nucléaire franco-belge des Ardennes (SENA) were approved by the Council on 6 September 1961 by means of the written procedure. In this way the first joint enterprise came into being in the course of 1961.

The representatives of the Governments of the Member States of the European Communities, meeting in Brussels for the 60th session of the EEC Council and the 46th of the Euratom Council, re-appointed the Commissions of these two Communities (1).

Furthermore, the Council unanimously approved the supplementary regulations governing the procedure to be followed by the Court of Justice.

During its 48th session (5, 6 and 7 March 1962) the Council discussed the procedure to tbe followed for the appointment of the members of the Economic and Social Committee for the period 25 April 1962 to 24 April 1966.

The Commission

215. On 10 January 1962 the representatives of the Member Governments, who had met in Brussels on 20 December 1961, renewed the appointments of Messrs. Enrico Medi, Paul De Groote, Heinz Krekeler and Emanuel Sassen, and by common consent appointed Mr. Pierre Chatenet to the Commission. In

(1) See also this chapter under "The Commission".

addition, Messrs. Chatenet and Medi were appointed President and Vice-President respectively for a period of two years.

The Court of Justice

216. By virtue of decisions taken on 26 September and 5 October 1961, the representatives of the Member Governments renewed for a period of six years, i.e. until 6 October 1967, the appointments of Messrs. L. Delvaux, Ch. L. Hammes and N. Catalano as judges, and Mr. K.R. Roemer as advocate-general.

In a session held on 11 October 1961, the Court re-elected Mr. A.M. Donner as President and Messrs. O. Riese and J. Rueff as Presidents of the Chamber.

In a letter dated 30 November 1961, Mr. N. Catalano resigned his appointment. During the Council's session on 5 and 6 February the representatives of the Member Governments nominated Mr. A. Trabucchi as successor to Mr. Catalano for the remainder of the latter's official term of office.

On 17 January 1962, with Mr. A.M. Donner presiding, the Court met in solemn public session for the swearing-in of the new President of the Commission and the other Members who had been re-appointed by the Council of Ministers for a period of 4 years commencing on 10 January 1962.

The Economic and Social Committee

217. During the period covered by the present Report, and in accordance with the provisions of the Treaty, the Council referred to the Economic and Social Committee for an opinion on the "Proposals on the First Steps to be Taken Towards a Coordination of Energy Policies".

The Committee was also informed by Vice-President Medi and Commissioner De Groote of Euratom's research programme, after which an exchange of views took place with the members of the Committee.

The Scientific and Technical Committee

218. In conformity with the role assigned to it by the Treaty, the Scientific and Technical Committee has been closely concerned with the drafting of the scientific programmes. The Committee met on 14 March, 23 May and 26 September 1961, and on 9 January and 13 March 1962.

The opinions handed down by the Scientific and Technical Committee have proved of great assistance in enabling the Commission to bring its activities in the realms of biology, fast reactors, participation in power reactor projects and marine nuclear propulsion into better focus. The relevant chapters of the present Report contain accounts of the Committee's views on the programmes put forward by the Commission.

In line with the terms of the Treaty, the Commission's proposals on the second five-year plan were submitted to the Committee in January 1962. After a preliminary exchange of ideas the Committee was able, albeit with reservations on certain points, to express a favourable opinion on the main features of the proposed programme. This study will be continued in greater detail.

The working group on training has continued to act as an advisory body to the Commission as regards the student trainee and advanced courses which are run by the Community's nuclear centres. The members of this working group have been of particular assistance in the creation of an effective selection process for candidates in each of the countries concerned.

In order the better to support the Commission with its advice, the Scientific and Technical Committee set up in January 1962 a new working group whose task is to examine, in collaboration with the responsible departments of the Commission, the problems bound up with the development of the ORGEL reactor string, and more particularly the choices with which the Commission will be faced in this respect in the course of 1962. In January 1962 the Committee agreed to expand this working group by including several experts from the Consultative Committee for Nuclear Research.

At the meeting on 13 March 1962 the above-mentioned working group submitted its report to the Scientific and Technical Committee.

On 9 January 1962, the Committee appointed its new officers, namely Mr. Gibrat as Chairman, and Messrs. Giacomello and Merre as Vice-Chairmen.

The Joint Services

A. *The Legal Service of the European Executives*

219. The close liaison and the practice of mutual consultation that had been instituted between the three branches of this Service have taken firmer root in the study of questions which are likely to affect more than one of the Communities. Moreover, on various occasions matters of common interest were dealt with by a single legal advisor representing the entire Service. Finally, several members of the Service are engaged on documentation work and the study of questions concerning all three branches.

The Euratom department of the Legal Service is studying problems bound up with the practical implementation of the Treaty and with the legal coordination of the activities of the various directorates. It has assisted in the studies undertaken by the services of the Commission by participating in working groups and providing opinions either orally or in writing.

B. *The Joint Press and Information Service*

220. During the period 1961/1962 the Joint Press and Information Service brought its establishment up to full strength and acquired the equipment necessary for the fulfilment of its task. Administratively, this service comes under the EEC Commission; consequently, a more comprehensive description of its activities can be found in the General Report of the EEC. The activities of this Service are organized and directed by an Administrative Board composed of the responsible Commissioners of the three

Communities. This structural set up has enabled the Official Spokesman of the Euratom Commission to undertake a large number of activities in conjunction with the Joint Press and Information Service.

In his capacity as purveyor of information, the Official Spokesman works mainly through the press, though advantage is also taken of other publicity media such as trade fairs and exhibitions, radio, television, films, courses, tours of inspection and publications. In all these sectors the cooperation between the Commission's Official Spokesman and the Joint Press and Information Service has proved extremely beneficial.

The Commission's press and information activities assumed a wider dimension in the course of 1961.

Besides day-to-day information, 40 bulletins of a general or specialized nature were dispatched to the Information Bureaux of the European Communities located in the capitals of all the Member States as well as in London and Washington, the intention being to provide journalists with a sound background of documentation on specific Euratom activities.

On the whole, the number of articles appearing in the press and dealing more particularly with the work of Euratom doubled during the period 1961/1962 as compared with the preceding year.

Fairs and Exhibitions

221. Besides the fairs and exhibitions organized by the Joint Press and Information Service for the three Communities, Euratom took part in two special events, viz. "Interschutz", which was held in Cologne in June and July, and "ACHEMA", an event organized on an international level for the chemical industry which took place in Frankfurt in June. In view of the interest they aroused among visitors representing industrial circles, these two operations can be said to have been an all-round success.

The Euratom Commission has continued to extend and improve the permanent exhibition housed in the Atomium at

Brussels. During the summer of 1961 this exhibition was visited by some 700 parties, for whose benefit lectures, film shows and literature hand-outs were arranged.

Among other fairs and exhibitions in which the Administrative Board decided to participate in 1962, was the Salon international de la Chimie (Paris, 27 April - 2 May), which was of special interest to the Euratom Commission.

Publications

222. Fifteen folders and booklets on Euratom were published either by or with the participation of the Joint Press and Information Service.

In addition, the Official Spokesman's Office published a special brochure dealing exclusively with the 4th General Report; this booklet, which appeared in English as well as in the four Community languages, gave rise to more than 200 articles in the international press.

Radio, Television, Cinema

223. The creation of a specialized section of the Joint Press and Information Service made it possible to disseminate a considerable volume of information on Euratom via newsreels and television and radio programmes. This section, moreover, assisted in the distribution of the film "Europe 235" and in the production of a documentary intended for exhibition to visitors.

Information Visits and Conferences

224. During 1961 there was a further increase in the number of information visits. The Official Spokesman's Office also helped to arrange a number of conferences and visits organized jointly by the three Communities.

Labour and Trade Union Information

225. Thanks to cooperation between the Official Spokesman and the Joint Press and Information Service, it was possible to

carry out various operations for the briefing of journalists and trade union lecturers.

University Information and Educational Activities

226. The Official Spokesman participated in the activities outlined in the programme of the Joint Press and Information Service, particularly as regards civics training for youth and adult education.

C. *The Statistics Office of the European Communities*

227. In its capacity as a joint service, the Statistics Office supplies the three European Communities with basic working documents and surveys on an ever-widening range of subjects. It will suffice here to mention the work carried out by the Statistics Office in the past year on behalf of Euratom.

In the field of energy statistics, the Statistics Office started preparing the ground for the compilation of energy balances, an undertaking focussing essentially on a definition of the extent to which the national and international statements are comparable and complete, and aimed at providing an overall view of the power economy structure in each of the Member States and in the Community as a whole.

A new set of statistics was compiled on the production, exchange and consumption of the various sources of power, with particular reference to electricity. With effect from 1962, these data will appear regularly in the new bi-monthly publication "Coal and Other Sources of Power", which replaces the former statistical bulletin "Coal and Steel".

For the purpose of coordinating statistics in the field of nuclear energy, a Statistical Committee for the Nuclear Industry was formed, on which a number of national experts sit together with representatives of the Statistics Office and of the Euratom Commission.

On the basis of the proposals made by this Committee, and in collaboration with various of the Commission's departments,

the Statistics Office drew up a number of questionnaires on the economic and social structure of the nuclear industry and on certain technical fields, the object being to elicit in this way the statistical data which are not automatically conveyed to the Commission under the terms of the Treaty.

The Coordination of Energy Policies

288. The inter-executive group on "Energy" continued the activities mentioned in the preceding General Report (Chapter IX, para 200 et seq.).

As a result of these activities a document entitled "Proposals on the First Steps to Be Taken Towards a Coordination of Energy Policies" was submitted to the Council of Ministers of the ECSC on 10 January 1961.

In the session held on 7 March 1961, the Council expressed its agreement with the principle of a coordinated energy policy designed to ensure the lowest possible energy price, while at the same time guaranteeing some measure of security in supply and taking account of certain social considerations.

The Council also agreed to hold periodical exchanges of views, attended by members of the inter-executive group, on structural and cyclical developments in the energy field.

In implementation of this decision, in the session on 16 May 1961 an exchange of views took place within the Council on the energy balance forecasts for the current year, while in the session on 16 October 1961 a discussion was held on a revised version of that forecast in which allowance had been made for data which had been received in the meantime.

These discussions revealed the weight attached by the Council to these forecasts which, progressively gaining in accuracy, are produced under the auspices of the inter-executive group and constitute an effective tool for drawing up surveys and formulating short-term policy.

The Council furthermore voiced the wish that the exchanges of views on the energy situation should take place as near as

possible to the start of the twelve-month period covered by the forecasts. In compliance with this wish, the report on "Prospects for the Supply and Consumption of Energy in the European Community in 1962" was submitted to the Council by the inter-executive group as early as mid-January 1962, and came up for discussion by the ECSC Council of Ministers on 23 January 1962.

As regards the "Proposals on the First Steps...", the Council took no decisions in its meeting on 7 March 1961, but instructed the inter-executive group to arrange talks between the national authorities responsible for energy affairs and the corresponding departments of the three Communities.

The ensuing talks spotlighted the grave misgivings entertained by the various governments with regard to the safeguards procedure proposed by the inter-executive group and designed to facilitate the taking of immediate and coordinated measures to offset any serious imbalance supervening in the energy market.

The initial steps proposed towards harmonization, on the other hand, aroused keen interest on the part of the Council.

The inter-executive group therefore concentrated its efforts on certain of these steps in order to arrive at detailed proposals to be submitted to the Council for approval.

As far as commercial policy on coal is concerned, these activities led to a proposal for harmonization of the systems already in use in various countries whereby the Community's coal industry is assured of temporary and degressive protection through a combination of high import duties and free quotas.

This proposal was the subject of a Council debate on 16 October and was also treated in talks with the responsible national authorities. From these bilateral contacts it emerged that Germany, where a similar procedure is already applied, is disposed to accept the proposal, and that Belgium, France and the Netherlands, whilst making certain reservations, are prepared to study it further, whereas Italy rejects it out of hand.

The substance of the objection is that commercial policy on coal should be integrated with an overall energy policy. This question will be looked into further by the Joint Board.

As regards commercial policy on oil, the inter-executive group has kept close track of the efforts made by the EEC Commission to bring about an agreement between the Member States on imports from countries where a state monopoly exists.

Unfortunately, nothing has yet come of these efforts, except for the fact that the decision taken by the Council of Ministers of the EEC in July 1961 to organize prior consultation on the commercial agreements has provided a limited possibility for the attainment of at least some of the objectives.

In a meeting of the inter-executive group held on 23 January 1962 it was decided that priority should henceforth be given to drawing up a common energy policy, without, however, abandoning the attempts to devise a more concrete definition for a number of "Proposals on the First Steps".

Statements to this effect were, moreover, made by the chairman of the inter-executive group in the course of a debate on the coordination of energy policy which was held in the European Parliament on 24 January.

229. With respect to the general trend set for energy policy, the representatives of the Euratom Commission have repeatedly pointed out that although the short-term measures demanded by the situation must indeed be taken—as far as possible in a concerted manner—it must nevertheless be borne in mind that these measures will to some extent necessarily imply a long-term commitment. In fact, if it is desired to ensure the necessary degree of continuity, it is hardly possible to distinguish between short-term policy on the one hand and medium- and long-term policy on the other.

In a few years' time, and certainly before the end of the present decade, nuclear energy will constitute an important new source of power. As mentioned in the chapter on "Industry and Economy", the study of the competitive prospects of nuclear energy which the Commission carried out on the basis of published data and information received from the circles concerned, indicates that by 1970 the nuclear kWh will be competing on equal terms with that

produced from high-grade coal or fuel oil. This significant finding is confirmed by the forecasts of American and British authorities who have actual industrial experience in the field.

The prospect that nuclear power will make the competitive breakthrough in the comparatively near future considerably widens the spectrum of solutions which can be applied to Europe's energy-supply problems. Once it has reached a competitive footing, nuclear energy will contribute to a progressive lowering of the power cost and to the attainment of the primary target of every energy policy, namely to make power available to the consumer at the lowest possible price.

An equally important consideration is the part nuclear energy can play in achieving the second aim of any energy policy, i.e. reliability of supply. Even if some of the nuclear fuel has to be imported, the ease of transport and the very small stocks required render nuclear energy an essential domestic source of power.

The inescapable conclusion is that immediate account must be taken of nuclear energy and the outlook for the present decade in the formulation of national energy policies and any future joint policy in the field of energy.

Cooperation in Other Fields

230. The appropriate departments of Euratom have participated in various activities of the EEC Commission in such fields as harmonization of industrial property rights in the six Community countries, free movement of labour, own resources, regional policy, industrial medicine and accident prevention in industry, vocational training, long-term structure and expansion studies, studies on the general economic climate, petroleum questions and negotiations under GATT.

As regards relations with the High Authority of the ECSC, the previously initiated cooperation was continued, notably through the participation of Euratom representatives in the

"General Objectives-Coal" group, in the High Authority/Council of Ministers Joint Board and in the "Economic Policy, Industrial Conversion" group.

Finally, it is worthy of mention that the international conference on "Technical Progress and the Common Market", held in Brussels from 5 to 10 December 1960 and organized jointly by the three Communities, was followed by the formation of an inter-executive group for the study of the issues brought to light at the conference. This group met three times during the period under review; its work related, among other things, to the organization by the three Executives of a seminar on "Economic and Social Possibilities for the Use of New Administrative Techniques".

CHAPTER VIII

ADMINISTRATION

ACHIEVEMENT OF PROPER BALANCE BETWEEN SCIENTIFIC AND TECHNICAL MANPOWER AND ADMINISTRATIVE STAFF — DIFFICULTIES INVOLVED IN RECRUITMENT OF TECHNICAL PERSONNEL — ENTRY INTO FORCE OF STATUTE OF SERVICE FOR PERSONNEL, REGULATIONS FOR OTHER EMPLOYEES AND COMMUNITY TAX SYSTEM — INSTITUTION OF PROVISIONAL COMMUNITY PROVIDENT SCHEME — CONTINUED RATIONALIZATION OF DEPARTMENTS OF HEAD OFFICE AND JOINT RESEARCH CENTRE BRANCH ESTABLISHMENTS

I. Personnel

A. *Size of Staff*

231. The manpower trend over the past year was marked by a definite expansion of the personnel coming under the research budget, whereas the recruitment of employees covered by the working budget remained more or less static. This difference is due on the one hand to the intensification of Euratom's scientific and technical activities and on the other to the Commission's desire to maintain its administrative staff at a level strictly in keeping with requirements.

The total staff employed at 31 March 1962 amounted to 1977 employees in respect of both budgets.

Research Budget

232. Staff recruitment continued to be maintained at a level commensurate with the development of the Community's research

programme. In this field, the Commission's abiding concern has been to make gradual and circumspect use of the scheduled budget items, taking account of the organisation and expansion of the Joint Research Centre branch establishments and also of the many agreements and contracts of association with other research centres.

The Commission's recruiting policy is illustrated by the following figures: as at 31 March 1961, 1,178 posts had been filled under the research budget, 80 of them by officials in possession of an offer of employment but who had not yet taken up their duties; as at 31 March 1962, 1,500 posts had been filled under the same budget, 82 of them by officials in possession of an offer of employment but who had not yet taken up their duties; this represents an increase of about 27 % on the personnel strength at 31 March 1961.

	Personnel on the job as of 31 March 1962		Holders of formal letters of appointment	
1) *Headquarters and Miscellaneous Staff*		115		4
2) *Joint Research Centre Branch Establishments* (including JRC staff working on long-term assignments under contracts being carried out elsewhere, other than those listed below)				
— Ispra	1,031		38	
— CNMB (Geel)	82		5	
— European Transuranium Institute (Karlsruhe)	30		10	
— Petten	6		4	
Sub-total :		1,264		61
3) *Associations, Agreements and Contracts*				
— BR-2	46		1	
— Fusion	56		11	
— Dragon	29		1	
— Fast Reactors	5		—	
— Biology	18		8	
Sub-total :		154		21
Total :		1,418		82

As a result of the very large number of persons who entered the service at the beginning of the financial year, due principally to Euratom's take-over of the personnel of the Italian Atomic Energy Commission (CNEN) at Ispra, budgetary appropriations began to be used up rapidly, the funds being replenished by credit transfers.

Despite this influx at the beginning of the year, the manpower level authorized as of 31 December 1961 (1670) has not been reached. This is accounted for mainly by the constant difficulties encountered by the Commission in the recruitment of technical (non-university) and executive staff.

As the salary scale applied by the Commission also raises a problem as regards the recruitment of scientific and technical staff, the Commission will keep very close track of the trend of salaries offered by the private sector and international organizations, with a view to putting before the competent authorities measures designed to remedy this situation in good time, in particular by applying the corrective coefficients provided for in the statute and periodically revising them.

Working Budget

233. The manpower coming under the working budget has been maintained at more or less the same level since 31 March 1961. At that date there were 512 officials actually employed, while at 31 March 1962 the corresponding figure was 559 out of 599 authorized posts, i.e. an increase of approximately 9 %.

This small percentage is evidence of the Commission's endeavours to limit its administrative staff to the strict minimum, while its success in so doing is the result of its policy of rationalizing working methods.

It must, however, be pointed out that the pressure of work has been growing continuously be reason of the steady increase in the personnel covered by the research budget. The Administration has to deal not only with a larger scientific and technical staff but also with a considerable number of locally hired personnel.

The inevitable conclusion is that the total number of posts scheduled for 1962, i.e. 599, is insufficient to cape with the situation satisfactorilly.

B. *Statute of Service for Personnel*

234. In February 1961, the Councils drafted in the first reading all the texts relating to the Statute of Service for the Personnel of the Communities, namely the Officials' Statute proper, the system applicable to "other employees" and the Community tax scheme. These documents were submitted to the European Parliament and the Court, which issued their opinion in October 1961 and expressed the wish that a Statute of Service should be worked out which could be common to the EEC, Euratom and the ECSC.

Attempts to arrive at this unified Statute of Service were frustrated mainly by the problem of salaries; one of the ECSC's conditions for its adherence to the Statute drawn up in Brussels was that the salaries should be at least equal to those now paid in Luxembourg. However, it was not possible for the Councils to reach agreement on this point, and in consequence the overall level of the salary scale adopted is approximately 3 % lower than that applied in the ECSC and that applied provisionally by the Brussels Communities.

Even so, it must be stressed that the draft unified Statute embodied a number of suggestions made by the Parliament, the Court and the EAEC, in particular those concerning the system of promotion, the virtually automatic linking of pensions to salaries and the granting of tax reliefs for officials with dependents.

Finally, on 18 December 1961, in line with Article 186 of the Treaty establishing the EAEC and Article 12 of the Protocol on the Privileges and Immunities annexed to the Treaty, the Councils of the EEC and the EAEC adopted an Officials' Statute, a system governing "other employees" and a Community tax scheme.

The foregoing unified Statute proposals concerning promotions the linking of pensions to salaries and tax relief for depen-

dents were maintained in the final text, thus leaving open the possibility of arriving, in the longer term, at a unified Statute.

On 18 December 1961, the Councils laid down the Statute of Service, whose entry into force was fixed for 1 January 1962.

In all likelihood, it will not be possible to apply these texts in their entirety for another six months. The implementing regulations, however, will be elaborated with the utmost dispatch.

While the Statute of Service for Officials was being drafted by the Coucils and the joint institutions, studies were being carried out in connection with the future application of the Statute.

C. *Social Security*

235. During 1961 the Commission, on the basis of proposals formulated by the administration heads of the Institutions concerned, laid down the provisions relating to the "Provisional Community Provident Scheme".

These measures were adopted to regulate the procedure for the transition from the provisional provident scheme to the pension scheme referred to in the Statute.

In addition, health insurance regulations based on the provisions of the Statute are now being drafted in conjunction with the other institutions concerned.

D. *Staff Associations*

236. Relations between the Commission and the Staff Association continued to be informed by a spirit of mutual understanding and cooperation. As before, the Commission has consulted the Association every time a problem has arisen which is of special importance as regards the welfare of the staff as a whole.

During the past year, two trade unions have been set up, one being affiliated to the International Confederation of Free Trade Unions and the other to the International Confederation of Christian Trade Unions.

The provisional Staff Committee has been formed.

E. *Medical Service*

237. The Euratom Medical Service, which has been set up at the temporary Headquarters, operates both in Brussels and in the branch establishments of the Joint Research Centre which are actually fonctioning. It should be mentioned that the Medical Service is also available to the personnel of the European Investment Bank and the Economic and Social Committee.

In accordance with the Treaty provisions, a central card-index containing all medical and dosimetric data on every member of the staff has been established.

As regards more particularly the branch establishments of the Joint Research Centre and the national centres, one task of the Medical Service is to harmonize and coordinate all the medical and medical-social activities engaged in by the local medical services. These efforts were aimed in the first place at the Medical Service at the Ispra establishment. The staff of the Geel-Mol establishment are under the direct control of the Medical Service in Brussels.

II. Administration

A. *Joint Research Centre*

238. Further progress has been made with the administrative organization of the Ispra and Geel-Mol establishments. The rationalization measures adopted consist mainly in decentralizing the various departments to the maximum extent compatible with the local conditions.

With regard to the accommodation facilities for the personnel of the Centre's establishments, there has been an increase in the number of dwellings available, notably at Ispra. While the majority of officials have thus been able to find homes, there still remains the problem of their dispersion over the usually sparsely populated areas in which the JRC establishments are located. The

Commission is doing everything possible to mitigate the inconveniences arising from this situation.

The examination of all questions relating to conventional risk insurance is now being carried out at the provisional Headquarters. As regards nuclear risks which do not involve physical injuries, the Commission is actively seeking a means of ensuring the greatest possible covering for such risks while at the same time keeping premiums within reasonable limits.

B. *Purchase*

239. Having regard to the terms laid down in the financial regulations, the improvements introduced in the purchasing procedures have made for both rapid and economic supplying of the Commission's departments.

The Consultative Committee on Purchases and Contracts (CCPC) has finalised a "Schedule of General Terms and Conditions for Supply Contracts" and fixed the relative procedure. These General Terms and Conditions will apply to all large orders and calls for tenders.

In order to reduce the procedure for the placing of orders to the simplest possible form, special attention has been devoted to the standardization and codification of equipment. With the same end in view, an "open contract" formula has devised; such contracts offer the advantage of guaranteeing a continuous supply of equipment in current use which for economic reasons is not kept in stock.

III. European Schools

240. The European School in Brussels is flourishing. The number of pupils has increased further and a new building was able to be opened in January 1962.

The European School at Mol has four language sections since the beginning of the scholastic year 1961. Work on the permanent building will commence in the immediate future.

The first stone of the permanent building for the Ispra-Varese school was laid towards the end of March 1961 and now the last phase of the work construction schedule has just been started.

At the Commission's request, the High Council for the European Schools has decided in principle on the creation of a European School in the vicinity of the JRC branch establishment at Karlsruhe. Negotiations are at present in progress on the subject.

The Commission, fully aware that the existence of the European Schools constitutes an increasingly important factor as regards the recruitment of personnel for the JRC branch establishments, once again records its satisfaction at the efficiency of the cooperation between the governments and institutions concerned, which is responsible for the large measure of success achieved.

CHAPTER IX

FINANCES

APPLICATION OF FINANCIAL REGULATIONS GOVERNING THE RESEARCH AND INVESTMENT BUDGET — IMPLEMENTATION OF WORKING BUDGET — IMPLEMENTATION OF RESEARCH BUDGET — FINANCIAL ADMINISTRATION AND SUPERVISION — CONTINUATION OF RESEARCH INTO COMMUNITY'S OWN RESOURCES

I. Budgetary Affairs

1. *Budgetary Organization*

In the course of 1961, the Commission continued its work on the drafting of the financial regulations referred to in Article 183 of the Treaty.

241. a) The financial regulations on the establishment and implementation of the working budget, having been approved by the Council of Ministers of the European Atomic Energy Community on 15 November 1960, are now before the Commission of the four Presidents of the European Coal and Steel Community, which is jointly responsible with the Council of Ministers of the European Atomic Energy Community for laying down those clauses of the regulations which govern the joint institutions.

242. b) The financial regulations concerning the establishment and implementation of the research and investment budget were

approved by the Council on 23 October 1961 (1). These regulations came into force on 1 January 1962.

The research and investment budget for the financial year 1962 has been set out in accordance with the new improved nomenclature annexed to these regulations.

243. c) The Commission of the EAEC submitted to the Council, which approved them on 5 March 1962, the financial regulations concerning the methods and procedure for making available the contributions of the Member States to the research and investment budget (referred to in Article 172, § 2, of the Treaty establishing the Community).

The text of the regulations consists to a large extent of a recapitulation of the provisions contained in the working budget regulations drawn up by the Council on 31 January 1961.

244. d) In 1961, the Consultative Committee on Purchases and Contracts, set up in 1960, i.e. sometime before its creation was required under the above-mentioned regulations, carried on with the pursuit of its constant objective to ensure that contracts are concluded in the best possible economic conditions.

245. e) The number of research contracts awarded by the Commission showed a considerable increase in 1961. It is worth mentioning, in fact, that out of commitments totalling 70,649 million u.a. for the financial year 1961 nearly 48 million u.a. were appropriated for the placing of contracts, both in Community and in non-Community countries.

By virtue of the large part of the budget taken up by these contracts, it has proved necessary to keep a very close check on the progress made in their performance and to harmonize the provisions governing the drafting and conclusions procedures. In addition, auditing of the contract-holder's records has been systematically developed.

(1) "Journal Officiel" No. 74 of 16 November 1961.

2. *Working Budget*

246. The Community's working budget for the 1961 financial year, laid down by the Council of Ministers on 7 December 1960, totalled 467,540,300 B. frs., of which 306,975,300 B. frs. came under Section III, relating to the Commission.

To these credits opened under the 1961 budget were added the credits brought forward from the financial year 1960 to the financial year 1961, these being authorized by the Council in the amount of 26,687,277 B. frs.

Of the 1961 credits, 276,279,574 B. frs. had been appropriated by 31 December 1961. Payments made as at that date amounted to 256,852,600 B. frs. Of the credits brought forward from te financial year 1960 to the financial year 1961, a total of 23,377,891 B. frs. have been paid.

During the financial year 1961, the Deutsche Mark and the Dutch florin were revalued. These monetary measures resulted in an automatic increase in certain items of budgetary expenditure which are effected in these currencies.

Although these revaluations involved by no means negligible supplementary charges, the Commission endeavoured to keep within the limits of the 1961 budget and succeeded in covering these unforeseen outgoings by credit transfers both for its own expenditure and for that of the Joint Press and Information Service.

The 1961 budget was administered in line with the provisions of the financial regulations laid down by the Council on 15 November 1960. The application of these provisions has not resulted in any appreciable changes in the administration of the credits, since the provisional rules previously followed by the Commission were based on identical principles.

3. *Research and Investment Budget*

247. The year 1961 was marked by a concentration of the Commission's main effort on the development of the Joint Research Programme.

The Ispra establishment in particular made further progress with the improvement of its equipment and organization.

The Central Nuclear Measurements Bureau continued its activity and the setting up of the Petten and Karlsruhe establishments was able to be undertaken.

The Commission has also focussed its attention on the preparation and conclusion af a large number of contracts which will enable European industry to make further headway in the field of nuclear research.

This aspect of the Commission's activity is reflected in the implementation of the research budget for the financial year 1961.

Fixed appropriations under the 1961 budget were of the order of 75.05 million u.a. Furthermore, in the course of the financial year 1961, the Council, acting on a proposal of the Commission, approved a supplementary budget amounting to 19 million u.a. representing the first series of commitments under a 32 million u.a. programme under which the Community would share in the information to be acquired in the construction and operation of power reactors.

The total amount of budgetary commitments for 1961 thus came to 94.05 million u.a.; when preparing the 1962 budget, however, the Commission decided on the cancellation of 9 million u.a. making the total amount of authorized budgetary commitments 85.05 million u.a.

The expenditure for which commitments were undertaken in the 1961 budget amounted to 70,649 million u.a., breaking down as follows:

	EMA u.a.
1. Personnel expenditure	6,671,565
2. Infrastructure, laboratories, minor equipment, heavy equipment, and special equipment	15,274,513
3. Contracts placed in the Community countries	42,887,049
4. Agreements and contracts entered into with non-Community countries	5,083,264
5. Documentation expenditure	399,861
6. Training expenditure	290.362
7. Miscellaneous expenditure	42,546
	70,649,160

The above total thus represents approximately 85% of the commitments provided for in the 85.05 million u.a. budget.

Payments effected in the course of 1961 amounted as at 31 January 1962 to 27,428,171 u.a. This arrears in payments is mainly attributable to the nature of the commitments, which very frequently arise out of the placing of orders for heavy and special equipment involving lengthy delivery dates. It must be added that with regard to Article 322—participation in power reactors—the only commitment undertaken in 1961 was for an amount of 19 million u.a., no provision being made for any payment under this head in 1961 or in 1962.

In addition, the point should be made that out of the payment authorizations—13,019 million u.a.—brought forward from 1960 to 1961, a total of 10,189 million u.a., or 78%, had been executed by 31 January 1962.

However, leaving aside one important operation, which has had to be postponed for very special reasons (the reference here is to contracts placed under the United States/Euratom Agreement, in respect of which credits brought forward amounted to 4,650,000 u.a. of which only 2,047,248 u.a. was able to be paid), the proportion actually utilized of the payment authorizations carried forward from 1960 to 1961 comes to more than 97%. Thus the total payments effected during the financial year 1961 amount to 37,617 million u.a.

4. *Fiscal and Customs Affairs*

248. During 1961, the Commission actively continued the negotiations with the Member States on the application of the fiscal and customs provisions of the Protocol on the Privileges and Immunities of the EAEC, under which the Community is exempt from both custom duty and direct and indirect taxes. These provisions are of special importance to Euratom, since its activities, and in particular its research programme, range over the whole of the Community's territory.

The methods and procedure for applying the fiscal and customs provisions of the above-mentioned Protocol raise a wide

variety of complex issues by reason of the divergences between the municipal laws on the subject.

Purchases made by the Community in the Member States and also the services which are performed for its benefit must be treated in an equal and comparable manner throughout the territory of the Community, which can only be done on a tax-exemption basis.

5. *Rendering and Auditing of Accounts*

249. In 1961, the Committee of Control continued to operate along the lines laid down in Article 180 of the Treaty and in the financial regulations governing the auditing and rendering of accounts.

The Community's administration accounts and balance sheet for the financial year 1959, together with the report drawn up by the Committee of Control, were submitted to the European Parliament and the Council of Ministers in 1961.

At its session on 22 January 1962, the European Parliament adopted the report of the Parliamentary Committee on Administration and Budgets relating to the accounts for the financial years 1958 and 1959.

The Committee of Control's report for the financial years 1960 was submitted on 15 November 1961. The EAEC Commission's reply to the observations contained in this report was conveyed to the Committee of Control on 21 December 1961.

The procedure employed for the financial year 1961 will probably be more expeditious than that applied for the previous years, as the Commission will be able to pass its administration accounts and balance sheet, accompanied by the Committee of Control's report for the financial year 1960, to the Council and the European Parliament during the first quarter of 1962.

In order to speed up further the submission of these documents for subsequent financial years, the Euratom Commission has presented to the Community Institutions concrete proposals

for reducing the time limits laid down in the Treaty and the financial regulations for the rendering and auditing of the accounts.

II. Financial Operations

250. In 1961, the Community's resources were made up, as stipulated in Article 172 of the Treaty, of financial contributions from the Member States.

Studies on the possibilities of replacing these contributions, wholly or partly, by levies (Article 173, § 1, of the Treaty) have been and will continue to be conducted in close cooperation with the EEC.

Since 1 April 1961, the collection of the Member States' contributions to the working budget has been carried out in line with the terms of the financial regulations governing the methods and procedure for making such contributions available to the Commission.

Applications for making available the contributions to the research and investment budget have been geared to the rate of payments made against this budget, so that the last contributions effected in 1961 were only made available at the beginning of 1962.

Another feature of the financial year 1961 was that the provisions of Article 181, paragraph 3, of the Treaty were applied at the time of the revaluation of the Deutsche Mark and the Dutch florin. Accordingly, the equivalent in units of account of the surplus resulting from these revaluations was refunded to the Member States concerned.

Under the United States-Euratom Agreement for Cooperation, the second invitation of submit proposals for joint projects was issued in the course of 1961. As regards the applications for participation entertained by the Commission, the terms and conditions for the loan to be granted were drawn up as the result of the discussions held with Eximbank in 1961.

The setting up of the various branch establishments of the Joint Research Centre and the performance of the contracts placed with outside bodies and firms has necessitated a higher degree of accuracy in the knowledge and classification of the financial data relating to the Commission's activities; this applies particularly to the coordination of the accounting operations of the various geographical units. For this purpose, measures are being applied with a view to improving the accounting organization, notably by introducing up-to-date methods and modern administration analysis techniques.

In 1961, the submission of accounting documents to the Committee of Control was effected in the regular manner in conformity with the financial regulations governing the rendering and auditing of accounts. By cooperation between the various European Institutions, it proved possible to achieve a certain degree of uniformity in the documents relating to the balance sheet and the administration account. This question will be examined more closely in 1962.

ANNEXES

Annex I

STAFF BREAKDOWN UNDER RESEARCH AND INVESTMENT BUDGET

Personnel Who Have Taken Up their Duties and Holders of Offers of Employment as of 31 December 1961

Posts filled on 31 December 1961

	A	B	C	Total A+B+C	Other employees	Sum total
Ispra	352	292	146	790	281	1,071
CNMB	29	25	23	77	7	84
Transuranium Inst.	23	8	8	39	—	39
Petten	6	—	1	7	—	7
	410	325	178	913	228	1,201
BR-2	23	17	8	48	—	48
Fusion	43	11	10	64	3	67
Biology	20	—	4	24	—	24
Fast Reactors	4	—	1	5	—	5
Dragon	26	1	1	28	1	29
Suspop	—	2	—	2	—	2
	116	31	24	171	4	175
Orgel	9	1	5	15	—	15
US Agreement Art. 5	6	1	3	10	—	10
Training	2	2	3	7	1	8
Radioisotopes	1	—	1	2	—	2
Miscellaneous	3	1	2	6	—	6
	21	5	14	40	1	41
Dissem. of Information	14	17	32	63	9	72
Health and Safety	2	1	—	3	—	3
Industry	4	—	—	4	—	4
	20	18	32	70	9	79
SUM TOTAL :	567	379	248	1.194	302	1,496
Posts approved on 31 December 1961	631	430	289	1.350	320	1,670

Annex II

RESEARCH AND INVESTMENT BUDGET 1961

Commitments as of 31 December 1961

Art.	Chap.	Heading	Commitments approved after amortisation and transfers	Commitments as of 31 Dec. 61	Available on 31 Dec. 61
	11	Salaries	6,410,—	5,657,—	753,—
	12	Allowances, recruiting	1,150,—	941,—	209,—
	13	Fees for experts and persons on special assignments ("qualified trainees")	250,—	073,—	177,—
	21	Maintenance and operation	2,700,—	2,591,—	109,—
221	22	Minor equipment	3,500,—	3,485,—	015,—
222	22	Major equipment	5,500,—	4,932,—	568,—
311	31	P.3111 - Dragon	4,750,—	4,750,—	—
		P.3112 - Halden	340,—	333,—	007,—
		P.3113 - Suspop	600,—	600,—	—
		P.3114 - Orgel	8,350,—	8,328,—	022,—
		P.3115 - Fast reactor	1,200,—	804,—	396,—
		P.3116 - Other reactors	500,—	—	500,—
312		P.3121 - Eur./US Agreement	10,000,—	4,750,—	5.250,—
		P.3122 - Related studies	500,—	002,—	498,—
313		Fissile materials	1,250,—	878,—	372,—
321	32	Reactor strings	500,—	052,—	448,—
322		Power reactors	19,000,—	19,000,—	—
323		Nuclear mercantile marine	4,900,—	4,890,—	010,—
	41	BR-2 and high-flux reactors	2,500,—	1,971,—	529,—
	42	Fusion	4,000,—	3,577,—	423,—
431	43	Biology	3,000,—	1,064,—	1,936,—
432		Radioisotopes	1,000,—	120,—	880,—
433		Scientific information and other research	1,500,—	1,118,—	382,—
	51	General documentation	400,—	400,—	—
	52	Training	1,000,—	290,—	710,—
	53	Patents and licences	250,—	043,—	207,—
		TOTAL	85,050,— (100 %)	70,694,— (83 %)	(17 %) 14,401,—

Annex III

RESEARCH AND DEVELOPMENT CONTRACTS AWARDED BY THE COMMISSION IN 1961

I. Research and Development Programme under the Euratom/US Agreement

	Name of Contractor	Title
I/1	SIEMENS SCHUCKERT-WERKE A.G. **Berlin and Erlangen**	Investigations on zirconium hydrides Zircaloy-2 and Zr Nb alloys
I/2	Commissariat à l'Energie Atomique (CEA) **Paris**	Studies on uranium monocarbide
I/3	INDATOM **Paris**	Study of resonance integral of U-238
I/4	Commissariat à l'Energie Atomique (CEA) **Paris**	Testing methods and equipment for the study of brittle fracture in thick steel plates
I/5	SOUDOMETAL **Brussels**	Overlaying of thick steel plates with stainless steel weld metal
I/6	BATTELLE Institute **Geneva**	The effect of radiation on the ductile-brittle transition in pressure vessel steels
I/7	SOUDOMETAL **Brussels**	Welding of steel in high-thickness
I/8	Soc. Générale d'Exploitation Industrielle, et Compagnie Centrale d'Eclairage par le Gaz LEBON et Cie **Paris**	Study on the transportation of irradiated fuels
I/9	Roentgen Technische Dienst (RTD) **Rotterdam**	Development of non-destructive measurement techniques

	Name of Contractor	Title
I/10	Schweißtechnische Lehr- und Versuchsanstalt (SLV) Duisburg	Electroslag welding of thick sections as required for reactor vessels
I/11	METALLGESELLSCHAFT Frankfurt/Main	Research on ZrNb and ZrSn alloys with a view to their use in water-cooled reactors
I/12	Centre d'Etude de l'Energie Nucléaire (CEN) Brussels	Research on the reprocessing of radio-active effluents
I/13	Centre d'Etude de l'Energie Nucléaire (CEN) Brussels	Reprocessing of irradiated fuels
I/14	Société ARCOS Brussels	Study of residual stresses induced by the vertical rise welding method
I/15	CHANTIERS DE L'ATLANTIQUE St-Nazaire	Studies on the electroslag welding of sheets
I/16	Centre d'Etude de l'Energie Nucléaire (CEN) Brussels	Preparatory work and development of process for the fabrication of a number of UO_2 Monocrystals
I/17	Centro Informazioni Studi ed Esperienze (CISE) Segrate	Study of light water-steam mixtures as reactor coolants
I/18	Maschinenfabrik Augsburg-Nürnberg A.G. (MAN) Augsburg	Burnout phenomena in boiling water reactors
I/19	Société Nationale d'Etude et de Construction de Moteurs d'Aviation (SNECMA) Paris	Improvement of heat transfer in boiling water reactors by means of side-by-side multiple turbulent flow

	Name of Contractor	Title
I/20	FIAT **Turin**	Swaging of uranium oxide fuel elements
I/21	Centro Informazioni Studi ed Esperienze (CISE) **Segrate**	Advanced study on the application of steam-water spray to the cooling of light-water reactors
I/22	Nuklear-Chemie und -Metallurgie (NUKEM) **Frankfurt/Main**	Fabrication of uranium carbide and UC-based cermets
I/23	Nuklear-Chemie und -Metallurgie (NUKEM) **Frankfurt/Main**	Fabrication of swaged UO_2 fuel elements
I/24	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Study of UO_2 monocrystals (with particular reference to their electrical properties)
I/25	HAHN-MEITNER-INSTITUT **Berlin**	Fission gas diffusion in reactor materials
I/26	Société d'Etudes, de Recherches et d'Applications pour l'Industrie (SERAI) **Brussels**	Preliminary design study of device for coating plutonium-containing ceramic particles
I/27	Toegepast Natuurwetenschappelijk Onderzoek (TNO) **The Hague**	Development of new shock-wave technique for determining the transition temperature of steels
I/28	NERATOOM **The Hague**	Fabrication procedures for pressure vessels
I/29	Société anonyme des Forges et Ateliers du Creusot **Le Creusot**	Study of brittleness in steel weldments
I/30	Compagnie Industrielle des Combustibles Atomiques Frittés (CICAF) **Corbeville p/Orsay (S & O)**	Fabrication of extruded UO_2 rods for irradiation in the Vallecitos VBWR reactor (USA)

	Name of Contractor	Title
I/31	Commissariat à l'Energie Atomique (CEA) **Grenoble**	Research on hydrodynamic instabilities restricting the power of boiling-water reactors
I/32	Compagnie pour l'Etude et la Réalisation des Combustibles Atomiques (CERCA) **Bonneuil s/Marne**	Use of nuclear fuels comprising a ThO_2 core and a ring of enriched UO_2
I/33	Société BELGONUCLEAIRE **Brussels**	Preliminary studies on irradiation tests with Pu-based fuel elements
I/34	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Neutron detector design study

II. Project ORGEL

	Name of Contractor	Title
II/1	Commissariat à l'Energie Atomique (CEA) **Paris**	Technological study of polyphenyls as coolants and (or) as moderators
II/2	Commissariat à l'Energie Atomique (CEA) **Paris**	Study of organic liquids in Aquilon II
II/3	Société PROGIL **Paris**	Design and construction of two loops for the technological study of polyphenyls as coolants or (and) as moderators
II/4	Société PROGIL **Paris**	Design study of loop for the investigation of polyphenyls under neutron bombardment

	Name of Contractor	Title
II/5	Allgemeine Elektrizitäts Gesellschaft (AEG) **Frankfurt/Main** Société ALSTOHM, **Paris** Société ANSALDO, **Genoa** Société EVENCE COPPEE, **Brussels**	Effect of variation in the steam characteristics on the cost and output of the conventional part of nuclear pouwer plants
II/6	Toegepast Natuurwetenschappelijk Onderzoek (TNO) **The Hague**	Studies on the relationship between the burnout heat flux of liquid organic reactor coolants and their composition in sub-cooled boiling
II/7	Compagnie pour l'Etude et la Réalisation de Combustibles Atomiques (CERCA) **Bonneuil s/Marne**	Study of the use of chromium as a diffusion barrier between uranium and aluminium
II/8	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Welding study on tubes and plates of sintered aluminium from various suppliers with varying oxygen contents
II/9	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Study of a metallically-bonded barrier to prevent interdiffusion between uranium (or uranium alloy) and aluminium. Evaluation of metallic or thermal limits
II/10	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Preliminary design study of loop to be installed in the BR-2 reactor
II/11	Société MONTECATINI **Milan**	Study of SAP fabrication procedures
II/12	Toegepast Natuurwetenschappelijk Onderzoek (TNO) **The Hague**	Polyphenyl analysis by thin-layer chromatography
II/13	Société PROGIL **Paris**	Tests to establish compatibility of terphenyls with materials used in the ORGEL programme

	Name of Contractor	Title
II/14	Réalisations ultrasoniques **Meaux**	Development, design and construction of an ultrasonic quality- and thickness-testing device
II/15	Société PROGIL **Paris**	Design and construction of a technological test loop
II/16	Free University of Brussels **Brussels**	Study of thermal and hydraulic behaviour of the ECO reactor under various conditions
II/17	Société d'Etude de la Propulsion par Réaction (SEPR) **Villejuif (Seine)**	Research on the mechanical stability of fuel element bundles
II/18	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Design study for in-pile loop for fuel element testing
II/19	Société d'Etudes, de Recherches et d'Applications pour l'Industrie (SERAI) **Brussels**	Design study of out-of-pile section of fuel element testing loop
II/20	Nuklear-Chemie und -Metallurgie (NUKEM) **Frankfurt/Main**	Fabrication of uranium monocarbide-based fuel elements
II/21	Groupement Atomique Alsace-Atlantique (GAAA) **Plessis-Robinson**	Drafting of technical appendix to contract for the preparation of a detailed draft design for the ESSOR reactor
II/22	Toegepast Natuurwetenschappelijk Onderzoek (TNO) **The Hague**	Study of technilogical problems bound up with ORGEL channel
II/23	NERATOOM **The Hague**	Preparation of preliminary draft for the design and construction of the ECO reactor

	Name of Contractor	Title
II/24	Società Ricerche ed Impianti Nucleari (SORIN) **Saluggia** Ateliers de Constructions Electriques de Charleroi (ACEC) **Charleroi**	Preparation of preliminary draft for the design and construction of the ECO reactor
II/25	Istituto Scienza Construzioni **Milan**	Research on mechanical stresses in ORGEL fuel elements
II/26	NERATOOM **The Hague**	Construction of the ECO reactor
II/27	Société d'Etudes, de Recherches et d'Applications pour l'Industrie (SERAI) **Brussels**	Study on the synthesis of organic molecules
II/28	Groupement Atomique Alsace-Atlantique (GAAA) **Plessis-Robinson** INTERATOM **Bensberg**	Studies on the initial preliminary draft for the design and construction of a test reactor
II/29	BELGONUCLEAIRE **Brussels** INDATOM, **Paris** SIEMENS SCHUCKERT-WERKE A.G., **Erlangen**	Studies on the initial preliminary draft for the design and construction of a test reactor

III. Fast Reactors

	Name of Contractor	Title
III/1	Société BELGONUCLEAIRE **Brussels**	Study of certain problems and experimental methods concerning fast-neutron critical assemblies
III/2	Société BELGONUCLEAIRE **Brussels**	Construction of mock-up for the study of very large fast-neutron reactor cores

IV. Controlled Thermonuclear Reactions

	Name of Contractor	Title
IV/1	INSTITUT FÜR PLASMA-PHYSIK Munich-Garching	Research on controlled fusion

V. Biology

	Name of Contractor	Title
V/1	Instituut voor de Toepassing van Atoomenergie in de Landbouw (ITAL) Wageningen	Research on radio-induced alterations in plants, foodstuff conservation by irradiation and the behaviour of specific radioelements in the soil, plants and animals
V/2	Institut Pasteur Paris	Interaction between radiations and deoxyribonucleic acids; biological effects
V/3	Liège University Liège	Study of radioprotective substances, their metabolism, their action mechanism and their possible uses
V/4	Free University of Brussels Brussels	Research on molecular biology (relations between BNA, RNA, proteins) and radiobiology
V/5	Commissariat à l'Energie Atomique (CEA) Paris	Studies and research tending to the establishment of radioactive contamination standards for the environment and the food chain
V/6	Louvain University Louvain	Micro-irradiation of chromosome segments; morphological, biochemical and genetical effects
V/7	Hydrobiology Institute Palanza	Study of the biology of fish in Lake Maggiore. Compilation of all data for use in estimating possible interactions between the fish and the radioactivity present in the lakewater

VI. Transplutonium Elements

	Name of Contractor	Title
VI/1	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Production of transplutonium elements
VI/2	Centre d'Etude de l'Energie Nucléaire (CEN) **Brussels**	Research on transplutonium elements
VI/3	Liège University **Liège**	Study of the chemical properties of transplutonium elements
VI/4	Reactor Centrum Nederland (RCN) **The Hague**	Research on transplutonium elements

VII. High-Flux Reactor BR-2

	Name of Contractor	Title
VII/1	Omnium Technique d'Etudes et de Réalisations (OTER) **Nantes**	Construction of a 1000 c hot cell
VII/2	BUREAU COMMUN NUCLEAIRE EUROPEEN Coordinateur: Architecte industriel BELCHIM **Brussels**	Critical assessment of a design concept for very high activity laboratories
VII/3	Société Nationale d'Etude et de Construction de Moteurs d'Aviation (SNECMA) **Paris**	Temperature measurements on BR-2 fuel elements

VIII. Scientific Data Processing

	Name of Contractor	Title
VIII/1	Louvain University Louvain	Research on the theory of games against nature Research on linear programming problems Introductory research on approximation problems
VIII/2	Freiburg University Freiburg/Breisgau	Analysis of scientific publications in the field of biology. Setting up of a "peekaboo" card index of selected terms suitable for use as a basis for a specialized computer language.
VIII/3	Stichting Studiecentrum voor Administratieve Automatisering (SSAA) Amsterdam	Study of semantic problems connected with chess
VIII/4	Association Marc BLOCH Paris	Research on the automatic analysis of bibliographical abstracts.
VIII/5	Bocconi University Milan	Critical examination of various statistical mehods in numerical calculation, linguistics and the processing of information in different forms
VIII/6	Tervueren Museum Brussels-Tervueren	Comparative study of the structures of African languages
VIII/7	Free University of Brussels Brussels	Development of algorithms for documentation analysis and automatic translation.
VIII/8	Centro Automazione Gallarate Gallarate	Standardization of automatic linguistic documentation by means of punched-card systems
VIII/9	Institut Inter-Universitaire des Sciences Nucléaires Brussels	Comparison of theoretical and experimental data on the interaction of nucleons
VIII/10	Société d'Economie et de Mathématique appliqués (SEMA) Paris	Development of optimum processes for the setting up of an automatic documentation system

IX. Marked Molecules

	Name of Contractor	Title
IX/1	Liège University Liège	Development of process for the synthesis of three tritium-marked compounds Development of a racemic-separation method for use with tritium-marked adrenalin compounds and various amino-acids
IX/2	Centre d'Etude de l'Energie Nucléaire (CEN) Brussels	Supply of H 3- and C 14-marked molecules
IX/3	Collège de France Paris	Supply of H 3-marked molecules
IX/4	Free University of Brussels Brussels	Marking lysozyme peptides with tritium and C 14
IX/5	Institut Interuniversitaire des Sciences Nucléaires Brussels	Development of methods for synthesizing and conserving tritium-marked hormones with high specific activities
IX/6	Institut Pasteur Paris	Development of method for synthesizing puric and pyrimidic bases strongly marked with C 14
IX/7	Collège de France Paris	Synthesis of H 3-marked hormones and study of conservation method for strongly marked compounds

X. Isotope Geology

	Name of Contractor	Title
X/1	Bundesanstalt für Bodenforschung **Hanover**	Dating of rocks and magmatic ores by methods deriving from nuclear physics
X/2	Free University of Brussels **Brussels** Comitato Nazionale per l'Energia Nucleare (CNEN) **Rome**	Geological age determination by radioactive methods Establishment of an isotopic chart of Tuscan calcareous rocks Paleotemperature determinations Study of variations in the isotopic make-up of precipitations in the Mediterranean basin Study of ice-samples brought back by the CNEN/Euratom Antarctic expedition

XI. Nuclear Marine Propulsion

	Name of Contractor	Title
XI/1	Gesellschaft für Kernenergie-verwertung in Schiffbau und Schiffahrt (GKSS) **Hamburg**	Marine propulsion
XI/2	Bureau VERITAS **Paris** Germanischer Lloyd **Hamburg**	Technical Safety Assessment of the NS Savannah
XI/3	Mr. LEGRAND **Brasschaat**	Cost calculation for consignments shipped by conventional vessels built and operated in the Community
XI/4	Mr. ILLIES **Hanover**	Study aimed at determining for which type of vessel or with which combination of speed and route nuclear propulsion can compete with conventional drive systems
XI/5	Reactor Centrum Nederland (RCN) **The Hague**	Marine propulsion
XI/6	Sociétés FIAT et ANSALDO **Turin/Genoa**	Marine propulsion

XII. Participation in Power Reactors

	Name of Contractor	Title
XII/1	Société d'Energie Nucléaire Franco-Belge des Ardennes (SENA) Chooz-lez-Givet	Participation in the construction of a power reactor
XII/2	Società Meridionale Energia Atomica (SIMEA) Latina	Participation in the construction of a power reactor
XII/3	Società Elettronucleare Nazionale (SENN) Garigliano	Participation in the construction of a power reactor

XIII. Radioisotopes

	Name of Contractor	Title
XIII/1	CARATOM Paris	Development of a device using radioisotopes for measuring hotrolled plate thicknesses
XIII/2	Toegepast Natuurwetenschappelijk Onderzoek The Hague	Tube wall thickness measurement Dispersion of static electricity by means of a gas flow ionized by nuclear irradiation Use of radioisotopes for calibration

XIV. Physical Measurements

	Name of Contractor	Title
XIV/1	Compagnie de Télégraphie sans Fil (CSF) Paris	Delivery of a linear accelerator equipped with CSF klystrons
XIV/2	Physikalisches Staatsinstitut Hamburg	Compilation of data on effective cross-section measurement values

XV. Geology

	Name of Contractor	Title
XV/1	Bureau d'Etude de Géologie Appliquée et d'Hydrologie souterraine (BURGEAP) Paris	Preliminary hydrogeological survey of the Ispra site
XV/2	Compagnia Generale di Geofisica (CGG) Rome	Study of Ispra region substratum
XV/3	BILLITON MAATSCHAPPIJ The Hague	Chemical analysis of ores and rocks with a view to obtaining standard samples intended for the laboratories of the Mineralogy-Geochemistry Dept

XVI. Hydrobiology

	Name of Contractor	Title
XVI/1	Hydrobiology Institute Pallanza	Study of currents and sediments in Lake Maggiore

XVII. Metallurgy

	Name of Contractor	Title
XVII/1	Omnium Technique d'Etudes et de Réalisations (OTER) Nantes	Preparation of draft design for the construction of medium-activity cells for the metallurgy department

XVIII. Reactor Physics

	Name of Contractor	Title
XVIII/1	HIGH VOLTAGE Amersfoort	Purchase of a linear accelerator
XVIII/2	Università degli Studi Padua	Macroscopic section measurements
XVIII/3	Società Ricerche ed Impianti Nucleari (SORIN) Saluggia	Protection problems

XIX. Reactor Study Contracts

	Name of Contractor	Title
XIX/1	Compagnie française THOMSON-HOUSTON, Paris Société ALSTOHM, Paris Allgemeine Elektrizitäts-Gesellschaft (AEG) Frankfurt/Main	Adaptation of vapotron process for reactor use
XIX/2	Centre National de la Recherche Scientifique (CNRS) Villeurbanne (Rhône)	Study of the oxidation mechanism in zirconium and zirconium alloys in various gaseous media
XIX/3	Bureau d'Etudes Industrielles Fernand Courtoy (BEI) Bureau d'Etudes Nucléaires (BEN) Brussels	Design concept for two shielded containers to be used for the transportation of spent fuel elements from the BR-2 and HFR reactors to the US reprocessing plant

Annex IV

LIST OF PATENT APPLICATIONS FILED BY THE COMMISSION AND ITS CONTRACTORS TO SAFEGUARD INVENTIONS DEVELOPED UNDER THE EURATOM RESEARCH PROGRAMME

(as of 31 March 1962)

No. of File	Title of Patent	Inventor *)	Holder	Origin
I/4	Fuel element for liquid-cooled nuclear reactors	Marchetti (Eur), Caprioglio (Eur)	Euratom	Euratom
I/5	Thermal conductivity measuring device	Peyssou of the CSF (France)	Euratom	Euratom/US Programme
I/6	Electrical spark-gap	André and Taquet (CEA)	Euratom	Euratom/CEA on Fusion
I/7	Cooling device for a reactor TV camera	Ellinger	Euratom	Dragon Project
I/8	Hermetic seal for pressure vessel port	Acton	Euratom	Dragon Project
I/9 I/10	Improvements in or relating to magnetic drive system	Sörensen	Euratom	Dragon Project
I/11	Ball lock clamping device	Sörensen	Euratom	Dragon Project
I/12	Improvements in or relating to nuclear fuel element handling plant	Franco (CNEN) Kinkead, Lockett, Sörensen	Euratom	Dragon Project

*) The inventors whose names are followed by the letters Eur in brackets are employed by Euratom.

No. of File	Title of Patent	Inventor	Holder	Origin
I/13	Improvements in receptacles for dangerous products, including radioactive products	Biteau (Eur), Dufresne (Eur)	Euratom	Euratom
I/14	Method of producing straight beams of matter within an enclosed space under high vacuum	Maisonnier (Eur)	Euratom	Euratom/CNEN Association on Fusion
I/15	Improvements in or relating to the electroplating of metals particularly uranium rods to be used as reactor fuel elements	Airola (Eur), Brossa (Eur)	Euratom	Euratom/CEN Contract (Orgel)
I/16	Improvements relating to the production of high-intensity magnetic fields by means of explosives	Linhart (Eur)	Euratom	Euratom/CNEN Association on Fusion
I/18	Electrolytic process for the preparation of pure metals in compact form and an apparatus for carrying out the process	Wurm (Eur)	Euratom	Euratom
I/19	Elements circulating mechanism	Hermann (Eur), Herpin and Planquart (CEN)	Euratom	BR-2 Association
I/20	Improved devices, placed inside a protection cell, for observation of objects or substances emitting nuclear radiation	Baudiffier (Eur) Dufresne (Eur)	Euratom	Euratom
I/21	Apparatus for the electrolytic cleaning and coating of metal objects, particularly uranium rods to be used as reactor fuel elements	Brossa (Eur) Tygat (CEN)	Euratom	Euratom/CEN Contract (Orgel)

No. of File	Title of Patent	Inventor	Holder	Origin
I/22	Cutting and welding pipes by remotely-controlled tools	Barnes, Harper, Hosegood, Taylor	Euratom	Dragon Project
I/23	The detection of non-condensable gases in fluids	Coudray	Euratom	Dragon Project
I/24	An observation port in a wall shielding radioactive radiation	Baudiffier (Eur)	Euratom	Dragon Project
I/25	Valve for fully remote maintenance	Ellinger	Euratom	Dragon Project
I/26	Spike assembly mounting tool	Collins, Harper, Hosegood	Euratom	Dragon Project
I/27	The mixture preparation of uranium and thorium carbides	Carley-Macauley, Williams	Euratom	Dragon Project
I/28	A thermionic emission converter for the direct conversion of thermal energy into electrical energy	Busse (Eur)	Euratom	Euratom
I/29	Fuel element mounting spike for purge gas flow	Collins, Harper, Horsley, Hosegood	Euratom	Dragon Project
I/30	Method and apparatus for sampling purge gas flow in nuclear reactors	Harper, Hosegood, Mitchell	Euratom	Dragon Project
I/31	Fluid-tight flanged seals and methods of making them by remote control	Ellinger	Euratom	Dragon Project
I/32	Method for creating and extracting ions and apparatus required	Coutant and Prévot (CEA)	Euratom	Euratom/CEA Association on Fusion

No. of File	Title of Patent	Inventor	Holder	Origin
I/33	Electrical connection between two conductors, one of which is a sheathed heating cable capable of operation at a high current density and the other of which is an ordinary conductor	Krüger (Eur), Mertel (Eur)	Euratom	BR-2 Association
I/34	A mass spectrometer for the examination of plasmas	Aymar and Brancher (CEA)	Euratom	Euratom/CEA Association on Fusion
I/35	A device for use in charging and discharging elements into and from an enclosed tubular magazine, designed particularly for nuclear reactors fitted with oblique channels containing fuel elements	Hermann (Eur)	Euratom	BR-2 Association
I/37	Support for irradiation samples which can be mounted in experimental channels in nuclear reactors	Hermann (Eur)	Euratom	BR-2 Association
I/38	Leaktight device for inserting and extracting dangerous elements, in particular radioactive elements in processing cells	Gauthier (Eur), Sayag (Eur) and Lentieul (Omnium Technique d'Etudes et de Réalisations, Nantes)	Euratom	BR-2 Association
I/39	Hermetic rotatable and slidable remote handling device	Babule (Eur), Gauthier (Eur), Sayag (Eur)	Euratom	BR-2 Association
I/41	Process for treating zirconium alloys	Anderko, Richter and Schleicher Metallgesellschaft (Germany)	Euratom	Euratom/US Programme
I/42	A movable remote-control gripping device	Babule (Eur), Gauthier (Eur), Sayag (Eur)	Euratom	BR-2 Association

No. of File	Title of Patent	Inventor	Holder	Origin
I/43	Variable throughput chromatography	Trillet and Vergnaud (Progil, France)	Progil	Euratom/Progil Contract (Orgel)
I/44	Multiple-contact electrical connectors	Barre (CEA)	Euratom	Euratom/CEA Association on Fusion
I/45	Method for improving the properties of sintered aluminium products, particularly those destined for use in reactors		ISML (Italy)	Montecatini Contract (Orgel)
I/46	Device for regulating lateral clearances between fuel elements and possibly reflector screens in a nuclear test reactor	Aranovitch (Eur), Bonnaure (Eur), Molica (Eur)	Euratom	Euratom
I/47	Method for reprocessing irradiated nuclear fuels by means of hydrofluoric acid	Schmets (CEN)	Euratom	Euratom/US Programme
I/48	Improvements to ducts for extracting nuclear particles from a reactor, in particular a test reactor	Bonnaure (Eur), Elbaz (Eur), Raievski (Eur)	Euratom	Euratom
I/49	Oscillation process with neutron source for nuclear test reactors, and a device for the execution of same	Bonnaure (Eur), Elbaz (Eur), Landes (Eur), Raievski (Eur)	Euratom	Euratom
I/52	Fuel element for nuclear reactors, in particular for test reactors	Hermann (Eur)	Euratom	BR-2 Association
I/53	Remotely controlled machine tool for use in hot containments in nuclear power plants	Hermann (Eur)	Euratom	BR-2 Association
I/54	Passing control shafts through radiation shielding	Hermann (Eur)	Euratom	BR-2 Association

No. of File	Title of Patent	Inventor	Holder	Origin
I/55	Device for removing rivets from tubular sections, e.g. cylindrical nuclear fuel rods	Hermann (Eur)	Euratom	BR-2 Association
I/56	Tool for closing and opening reactor channels equipped with a bayonette-type closure plug	Marchal (CEN)	Euratom	BR-2 Association
I/59	Improvements in or relating to pressure relief devices	Harper, Hosegood, Mitchell	Euratom	Dragon Project
I/60	Improvements in or relating to measuring fluid temperatures (thermocouples for gases)	Dalle Done (Eur) Bowditch	Euratom	Dragon Project
I/61	Improvements in or relating to reactor periscopes	Ellinger	Euratom	Dragon Project
I/62	Improvements to neutron shields for liquid- moderated solid-reflector test reactors	Bonnaure (Eur)	Euratom	Euratom
I/63	Carbon articles made from powder	Bickerdike, Hughes	Euratom	Dragon Project
I/64	Improvements in or relating to galvanic cells for oxygen measurements (thalium anode cell)	Kinsey	Euratom	Dragon Project
I/65	Improvements in or relating to extensometers - bolt extensometers	Ellinger	Euratom	Dragon Project
I/66	Improvements in or relating to systems for measuring reactor temperatures - microwave noise measurement of reactor temperatures	Jaques	Euratom	Dragon Project

No. of File	Title of Patent	Inventor	Holder	Origin
I/67	Improvements in or relating to machine tools - machine tools flange grinding	Ellinger	Euratom	Dragon Project
I/68	Improvements in or relating to sensing systems	Darby, Kinkead, Sörensen, Walker	Euratom	Dragon Project
I/69	Improvements in the fabrication of nuclear fuels	Jonckheere, Van Geel (Belgonucléaire)	Belgo-nucléaire	Euratom/US Programme
I/71	Fine reactor control		RCN	Association RCN-KEMA Suspop reactor
I/72	Methods and apparatus for microanalysing very thin sheeting by electronic scanning	Theisen (Eur) Lemaitre (Eur)	Euratom	Euratom
I/74	Tubular handling arms for remote-control handling equipment, in particular for nuclear reactors	Hermann (Eur)	Euratom	BR-2 Association
I/75	Activating mechanism for tubular flexible and coilable handling arms	Hermann (Eur)	Euratom	BR-2 Association
I/76	Automatic phase-displacement measuring methods and corresponding apparatus	Ray (CEA) Bliaux (CEA) Neyron (CEA) Papoular (CEA)	Euratom	Euratom/CEA Association on Fusion
I/77	Improvements in or relating to the manufacture of graphite by modifying the graphite/carbon black formulation	Jenkins Longstaff Price	Euratom	Dragon Project
I/80	Method and device for purging fluids by injection of a reagent	Lopes Cardozo (Eur) Dejonghe (CEN)	Euratom	Euratom/US Programme

No. of File	Title of Patent	Inventor	Holder	Origin
I/84	Method for hot-pressure sealing of thin-walled metal tubes and device for execution of the process		ISML (Italy)	Montecatini Contract (Orgel)
I/85	Electrical spark-gap constant insulation	André (CEA)	Euratom	Euratom/CEA Association on Fusion
I/89	Improvement to remote-handling device given in I/39	Sayag (Eur) Babule (Eur) Gauthier (Eur)	Euratom	BR-2 Association
I/91	Coloured indicator for thin-layer chromatography of polyphenyl mixtures	Schlitt (Eur)	Euratom	Euratom
I/92	Electromagnetic coil	Bariaud (CEA) Hubert (CEA)	Euratom	Euratom/CEA Association on Fusion
I/93	Method for obtaining a passage between two contaminated compartments, and sealing device for execution of the process	Prüss (Eur)	Euratom	Euratom
I/97	Joint for tubular sample-holder	Hermann (Eur)	Euratom	BR-2 Association
I/98	Valve with spherical plug	Martin (CEA)	Euratom	Euratom/CEA Association on Fusion
I/99	Method for reprocessing nuclear fuels containing carbon in their structure and/or cladding	Francesconi Lambiet Schmets	CEN	Euratom/US Programme
I/100	Method for cladding uranium carbide with niobium	Theisen (Eur)	Euratom	Euratom

No. of File	Title of Patent	Inventor	Holder	Origin
I/101	Improvements in or relating to meter indicators	Dean	Euratom	Dragon Project
I/103	Improvements in or relating to machine-tool operations for flanged joints	Ellinger	Euratom	Dragon Project
I/118	Expansion measurement device	Baugnet (CEN) de Clercq (CEN)	Euratom	BR-2 Association
I/122	Constant-power variable-gear mechanical transmission	Cogez (Eur)	Euratom	Euratom
I/123	Reactor core with fissile material rods and support grid		RCN	Euratom/RCN Contract (Marine Propulsion)
I/125	Dismantlable insulation can for fuel elements	Alfillé (Eur)	Euratom	Euratom
I/126	Improvements to nuclear fuel elements	Chambaud (Eur) Alfillé (Eur) Briola (Eur) Dufresne (Eur)	Euratom	Euratom
I/132	Leaktight connecting plug	Cogez (Eur)	Euratom	Euratom
I/135	Hermetic hydropneumatic absorbing rod drive		Interatom	Euratom-Interatom-GKSS Contract (Marine Propulsion)
I/136	Heterogeneous reactor		GKSS	Euratom/GKSS Contract (Marine Propulsion)
I/137	Flooding device for a marine reactor compartment		GKSS	Euratom/GKSS Contract (Marine Propulsion)

No. of File	Title of Patent	Inventor	Holder	Origin
I/138	Machine plant		GKSS	Euratom/GKSS Contract (Marine Propulsion)
I/139	Device for regulating reactor reactivity		GKSS	Euratom/GKSS Contract (Marine Propulsion)
I/140	Ship's hull with steel superstructure		GKSS	Euratom/GKSS Contract (Marine Propulsion)
I/144	Carbon-containing substances with predetermined pore distribution	Bantolila (Rehiney) Cornuault Price	Euratom	Dragon Project
I/145	Method and device for the leaktight sealing of tubes without melting	Meulemans (CEN) Musso	CEN	Euratom/CEN Contract (Orgel)

Annex V

SCIENTIFIC AND TECHNICAL PUBLICATIONS RESULTING FROM THE EURATOM RESEARCH POGRAMME AND PUBLICATIONS OF A MORE GENERAL CHARACTER

(The authors of the publications listed are members either of Euratom research teams or of enterprises with which Euratom has signed contracts)

SUMMARY

I. BIOLOGY AND MEDICINE

MASSART A.
HENRY J.

A propos d'un cas de radionécrose tardive après exposition accidentelle à des rayons X

Article : *Journal belge de radiologie,* Bruxelles, Vol. XLIV (1961), part. 6, p. 667.

MASSART A.
HENRY J.
RODESCH J.

Zur Therapie einer tardiven Radionekrose

Paper : *2. Fortbildungstagung der Vereinigung deutscher Strahlenschutzärzte e.V.,* Essen, 3-6.1. 1962.

MERLINI M.

An Autoradiographic Study of the Site of Biosynthesis of Thyroid Hormones in a Lower Vertebrate

Paper : *European Symposium on Autoradiography in Medical Science,* Rome, 17-18.6.1961.

MERLINI M.
RAVERA O.

Differenze biometriche e ponderali tra popolazioni di Unio pictorum, L. (Molluschi, lamellibranchi) del Lago Maggiore

Paper : *Franco-Italian Colloquy on Health Physics,* Turin, 5-6.6.1961.

RAVERA O.
VIDO L.

Misura del Mn^{54} in popolazioni di Unio pictorum L. (Molluschi, lamellibranchi) del Lago Maggiore

Article : *Memorie dell'Istituto Idrobiologico,* Pallanza, Vol. XIII (1961), p. 77.

RODESCH J.
MANDEL P.

Effet des rayons X sur les acides nucléiques de la peau

Proceedings of the 5th International Congress of Biochemistry, Moscow, 10-16.8.1961, Pergamon Press, 1961, p. 489.

II. GENERAL AND NUCLEAR CHEMISTRY

BERTOLINI G.
GIRARDI F.

Sequential Separation Schemes for Long-Lived Gamma-Emitting Impurities in Neutron Activated Aluminium

Paper : *Journées de travail pour l'analyse par activation,* Grenoble, 2-3.5.1961.

CAMERA V.

Metodo colorimetrico per la determinazione di microquantità di uranio in materiali organici e inorganici, mediante 1 (2-piridilazo) — 2-Naftolo (PAN)

Article : *La Medicina del Lavoro,* Milan, Vol. LII (1961), no. 1, p. 59.

DUBINI M.
FANTECHI R.

Sintesi di alcune molecole marcate e determinazione delle loro radioattivita

Article : *Annali di Chimica,* Rome, Vol. LI (1961), p. 587.

DURHAM R.M.
GIRARDI F.

Effective Neutron Activation Cross-Sections of Some Chlorine and Sulfur Reactions in NRX

Article : *Il Nuovo Cimento, Bologna, Suppl.* Vol. XIX (1961), Series X, no. 1.

GEISS F.
SCHLITT H.

Analyse von Polyphenylgemischen mit der Dünnschichtchromatographie

Published by Euratom, 1961.

GIRARDI F.

New Activation Analysis Techniques at Euratom's Ispra Centre

Paper : *Conference on Modern Trends of Activation Analysis,* College Station, Texas, 15-16.12. 1961.

GIRARDI F.
PAULY J.

Analisi di materiali per l'industria nucleare mediante attivazione con neutroni

Paper : *Giornate dell'Energia Nucleare,* Milan, 15-16.12.1961.

LAUER K.F.
LE DUIGOU Y.

Genaue Endpunktbestimmung in der Potentiometrie

Article : *Zeitschrift für analytische Chemie,* Bd. 184 (1961), no. 1, p. 4.

SUNDERMANN H

De la séparation magnétique fractionnée des phases intermétalliques et métalloïdes

Article : *Les mémoires scientifiques de la revue de métallurgie,* Paris, T.LVIII (1961), no. 9, p. 655.

VAN WAMBEKE L.
PINTE G.

Dosage de scandium dans les wolframs au moyen de l'analyse par activation

Article : *Bulletin de la Société chimique de France,* Paris, December 1960, p. 1901.

III. MACHINERY AND APPARATUS

BEHRISCH R.
BLAUTH E.
MELZER F.
MAYER E.

Erweiterung des Messbereiches bei einem elektrostatischen Massenspektrometer

Paper : *Physikertagung* Vienna 1961 - *Physikalische Verhandlungen,* 9, 224, 1961, Physik-Verl. Mosbach, Baden.

BERTOLETTI S.
LESAGE J.
LOMBARDI C.
PETERLONGO G.
SILVESTRI M.
SOLDAINI G.
WECKERMANN F.

Heat Transfer and Pressure Drop with Steam-Water Spray

Published by CISE, 1961.

COLOMBO G.
DE LOTTO I.
GIANELLI G.

A Transistorized 1024-Channel Neutron Time-of-flight Analyser

Proceedings of a Symposium Organized by the European-American Nuclear Data Committee in Collaboration with Centre d'études nucléaires de Saclay, Saclay, 24-27.7.1961, Published by Euratom, 1961.

DE LOTTO I.

Echelle d'adresse et mémoire temporaire pour un analyseur de temps de vol transistorisé

Paper : *Conference on Nuclear Electronics,* Belgrade, 15-20.5.1961.

DE LOTTO I.

Alimentatore stabilizzato di potenza completamente transistorizzato

Paper : *Convegno-Mostra dell'Automazione e Strumentazione,* Milan, 7-12.11.1961.

DE LOTTO I.
SALON J.
TERMINANI A.

Contatore decimale avanti-indietro

Paper: *Convegno-Mostra dell'Automazione e Strumentazione,* Milan, 7-12.11.1961.

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