

EUROPEAN ATOMIC ENERGY COMMUNITY
EURATOM
THE COMMISSION

EIGHTH

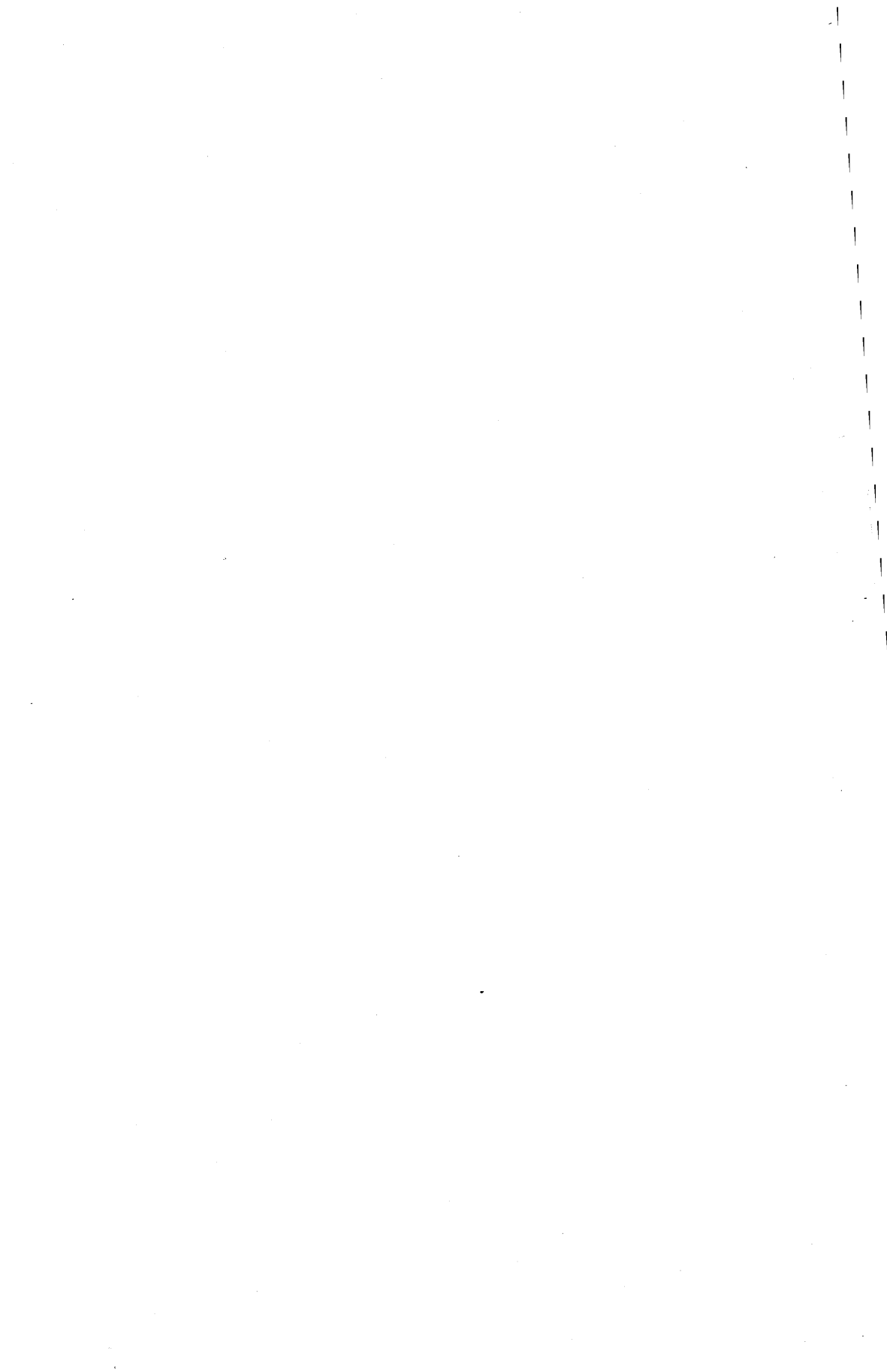
General Report

on the

Activities of the Community

(March 1964 - February 1965)

MARCH 1965



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VOLUME II

Documentation attached to eighth general report

INTRODUCTION

At its May 1965 meeting, the Council of Ministers decided upon the adaptation of the second Euratom five-year programme.

This decision marked the culmination of a procedure which the Commission had initiated at the beginning of 1964 on the conditions laid down by the Treaty.

There were two main reasons for this adaptation: on the one hand, the prices and wages which had been taken as a basis in drawing up the second programme had risen to such an extent that the various targets set were no longer attainable in the scheduled time-limits with the funds originally appropriated; on the other hand, power reactors were gradually entering the industrial phase and the major stages in nuclear development over the next 10 to 15 years were more clearly discernible.

The task of adjusting the programme has been a laborious one, in view of the need to reconcile viewpoints differing by reason of the divergent paths taken by nuclear development and the dissimilarities in economic and industrial conditions between the six Community countries.

While the financial effect of the Council's decision was to boost the revised appropriation for the second programme from 425 million to 430.5 million EMA u.a., far more was involved than a mere increase of 5.5 million EMA u.a., since it proved possible to divert to priority projects credits to the tune of 34.8 million EMA u.a. previously allotted under other heads of the programme.

But what is even more important is the fact that this decision at Foreign-Minister level reflects the united political resolve of the Member States to forge ahead with their activity in the nuclear field within a European framework and in accordance with the Community system.

With the present situation thus clarified, the Commission of the European Atomic Energy Community is now in a better position to plan for the future.

It is therefore in a calm and confident frame of mind that the Commission is submitting to the European Parliament the account of its activities in 1964,

which were designed mainly to open up the way for the advancement of nuclear energy to the industrial stage along the main guide-lines set out in the introduction to the previous Report.

I. Present situation of nuclear energy in the Community

1. The rapid expansion of energy requirements and the growing scale of imports became accentuated during the past year, which bears out the fact that nuclear energy will be called upon to play an ever greater part in alleviating the Community's state of dependence in this respect in relation to the rest of the world. Moreover, the decision taken by the Council of Ministers of the European Coal and Steel Community on 21 April 1964 concerning the joint energy policy throws into sharp relief the role which will be required of nuclear energy in meeting the Community's power demands.

2. The integration of nuclear energy into the economy continued during the past year. The third United Nations Geneva Conference in September 1964, which was attended by nuclear experts from seventy-five countries, afforded clear evidence that nuclear power plants are economic, a fact which is corroborated by the achievements of both governments and industrialists in the Community as well as in the rest of the world.

In the Community, the year 1964 was marked not only by the highly satisfactory operation of four power plants but also by further progress in the construction of a number of other large-scale units and by the blueprinting of new projects.

In France, the EDF 1 power plant, which has been in operation since 1962, was supplemented early in 1965 by the EDF 2, while the setting-up of EDF 3 and EDF 4 has proceeded according to schedule. A start is to be made with construction of EDF 4a and EDF 5 in the course of the current year. Furthermore, under the fifth five-year plan, an average of 500 MWe is to be installed annually. In Italy, apart from the Latina, Garigliano and Trino Vercellese plants already commissioned, the draft first five-year programme provides for the installation of a total capacity of 680 MWe by 1969. Germany's first power plant, at Gundremmingen, will start up in 1966. It has further been decided to construct two other such units at Lingen and Obrigheim. The Doodewaard reactor in the Netherlands will be commissioned in 1968, while the Franco-Belgian Ardennes power plant (Chooz) is slated

for completion in 1966. On top of all these projects, there are plans for a joint Franco-German power plant, two big Belgian reactors and a large German heavy-water-moderated power plant. Meanwhile, France and Germany are proceeding with the installation of medium-sized heavy-water reactors.

Nuclear energy, then, has been well and truly launched in the Community and the outlook for its development points clearly to the existence in the six Community countries of a potential market for nuclear installations which is estimated to achieve a growth-rate comparable to that observed in the United States and the United Kingdom.

The importance of nuclear energy in the industrial world of tomorrow is further brought out by certain estimates—cautions and minimal—according to which this source of energy will as from 1980-1990 account for the entire increase in thermal-plant capacity; on this assumption, there will by the year 2000 be more than 370,000 installed nuclear MWe, representing about two-thirds of the Community's total electricity production and well over a third of its overall energy needs.

3. Having regard to the expansion of its market, it is incumbent upon the Community to cover as much of its needs as it can from its own industrial resources, which calls for a nuclear engineering industry solid and dynamic enough to withstand world competition.

Some progress has been recorded in this field. French industry is already supplying all requirements under the national reactor programme; again, almost all the equipment for the German power plant to be constructed under decisions taken in 1964 will be of European origin.

The fact remains that in certain key sectors—notably slightly enriched uranium fuel-element fabrication and, to a lesser extent, reactor cores and monitoring devices—the Community's facilities will require reinforcement.

On the more general plane, the Community still does not possess an industrial set-up consonant with the demands of nuclear development, nor are its industries yet organized in line with the widening market in this sector. Unduly confined as they are within the limits of the national markets, they are still incapable of turning to account the advantages inherent in a vast economic entity. These basic conditions, moreover, must match the progress of the Common Market in the years ahead.

Moreover, groups have sometimes been formed in the Community each of which has external links, frequently close-knit, with the outside world which owe nothing to any kind of joint-negotiation process.

There is accordingly an urgent need to create appropriate conditions for counteracting the tendencies towards dispersion and the operation of centrifugal forces, as well as to promote the concentration of nuclear industries on a European scale, thus opening up the way for the attainment of a competitive position both on world markets and in Europe, where external competition is becoming increasingly keen.

With this in mind, the Commission, in the implementation of the second programme, is fostering closer ties between European industries by assigning to them important projects for joint execution.

However, its efforts in this direction, of necessity limited as regards their influence on the entire range of European industries engaged in nuclear activity will not be meaningful or effective unless they are accompanied by more far-reaching measures designed to bring about a Community-wide industrial policy.

4. The foregoing considerations apply both to proven-type reactors and to reactors of the second and third generations (heavy-water, advanced-gas, fast), on which numerous research and development projects have been launched by the major Western powers and in which fields the Community, failing adequate industrial structures, would be liable to miss the opportunities open to it by comparison with the outside world.

In this connection, mention must be made of the interest recently aroused by the ORGEL string in the United States, which is contemplating projects of this type. The Commission, for its part, is at present studying ways of enabling the Community to derive the maximum benefit from this string, which stems from a Community-inspired concept.

As regards the fast-neutron string, the prospects are much more favourable in the principal non-Community countries, where the industries concerned have an advantage over that of the Community by virtue of their more compact structure. Here too, an all-out joint effort must be made if the Community does not want to lag behind.

II. Setting up joint policies

The Commission is still of the opinion that three aims in particular call for the adoption of a joint policy, namely, the setting up of industrial targets, the development of a common supply policy and the coordination of programmes, and that, by reason of the very width of their scope, these objectives will remain in the forefront for several years to come.

1. *Fixing industrial targets*

- a. Under Article 40 of the Treaty, the Commission periodically publishes programmes indicating in particular the production targets for nuclear energy and the various types of investment required for their attainment. The aim of such programmes is to stimulate initiative among persons and enterprises engaged in or concerned with nuclear activity and also to facilitate the coordinated development of investments in this sector.

For a long time, the establishment of a target programme has been hampered by insufficient knowledge of the parameters of the nuclear economy. Now that nuclear energy is entering upon its industrial phase, it is becoming possible not only to forecast the overall development of this form of energy but also to attempt to assess the prospects for the various reactor types and the scale of investment required in the various sectors of nuclear activity in order to achieve certain specific goals.

Such is the purpose of a report which the Commission drew up in the course of the past year and which it is now discussing with the parties concerned in order to obtain their observations before submitting these problems to the Economic and Social Committee for an opinion.

The report confines itself to electricity generation in large power plants, this being the only one of the many ways of harnessing nuclear phenomena for which concrete data are available in a quantity substantial enough to serve as a basis for forecasts.

The investments required for electricity generation will not, however, be confined to the actual power plants. They will also be needed, for example, in various other industrial sectors, with particular reference to those dealing with ore extraction and processing, isotope separation, fuel element fabrication and irradiated fuel reprocessing. The target programme will therefore cover the main industries involved in the construction and operation of the generating plants scheduled.

- b. The preliminary studies showed the Commission that a target programme would lose a great deal of its point unless an appropriate industrial development policy were adopted.

The prospects for expansion are contingent on both the availability of adequate nuclear fuel resources and the prospect of stepping up the Community's potential for the construction of nuclear installations capable of reaching the envisaged production targets.

The fact is that the shortcomings already manifest in certain specific fields of industry and in the present structures of the European nuclear industry in general are liable, if not remedied, to compromise the Community industry's chances of accomplishing the tasks it has to face.

Consequently, the Commission has followed up the first draft target programme with a document on a joint industrial policy dealing with the organization of the administrative and social infrastructure, the development of the market for power reactors, the introduction of improvements in the power-plant construction sectors and, finally, the supply of nuclear fuel.

2. Revision of the Treaty provisions relating to supply

Pursuant to the Treaty, the provisions of Chapter VI relating to supply are subject to revision.

The Commission's concern that due allowance should be made for the changes in economic conditions is mirrored in its proposal to the Council that this Chapter be amended in the following three respects :

- for the principle of equal access to resources, which in certain circumstances may result in the supplying of improvident users to the detriment of those who would have carried out the necessary investments in good time, the Commission has deemed it advisable to substitute the principle of non-discrimination, which is already embodied in the EEC Treaty;
- to ensure closer alignment with the market situation, the Commission proposes that the rules governing the conclusion of supply contracts should be liberalized, without prejudice, however, to the Agency's exclusive right to enter into such contracts when warranted by exceptional economic conditions;
- finally, the Commission finds the provisions of Chapter VI as they now stand inadequate to the purpose of evolving a common supply policy and considers that they should be supplemented in connection with various important points in this field.

3. Coordination of programmes

When submitting its proposal for the adaptation of the second programme, the Commission impressed upon the Member States its concern to improve the coordination of the various national programmes both with each other and with the Community programme. However, the very close correlation between research programmes and industrial goals was one of the causes underlying the difficulties which the Member States had to overcome before taking their decision in May last year.

While the present compromise goes some way towards clarifying the situation as regards the medium- and long-term aims, it does not provide a solution

to all the problems involved and the Commission intends to get as far ahead with its work in this field as possible, making appropriate allowance for the factors which emerge from the studies undertaken with a view to devising the target programme and laying down an industrial policy.

It is indeed from these two angles—industrial objectives and research programmes—that we must examine the facets of genuine Community-scale cooperation in the nuclear field.

This, moreover, is a propitious moment for such activities, since the economic assessments of a number of techniques are now more reliable and thus make for greater accuracy in forecasting.

III. The merger of the institutions and the Treaties - What is the outlook for Euratom?

The Commission, which has always favoured the merging of the Community institutions, applauds the decision adopted on 8 April 1965 and is certain that this move will act as a stimulus to Community-level activities. Moreover, it is aware of its own worth as a source of experience in the scientific and industrial fields and considers furthermore that the fusion of the Treaties will provide a sounder basis for the development of nuclear energy.

As regards the coordination of scientific programmes, the three Executives have set up a working group—the initiative in this matter having been taken by Euratom in November 1964—to canvass the entire gamut of problems involved. In addition, a working group of scientific policy has recently been formed within the framework of the Committee on Medium-Term Economic Policy, and the High Authority and the Euratom Commission are closely associated with its activities. It is the Commission's view that the role of coordinator in the scientific field requires not only experience which can be called upon in singling out the problems to be tackled but also funds sufficient to make for smoother coordination and to ensure that activities are undertaken along the right lines.

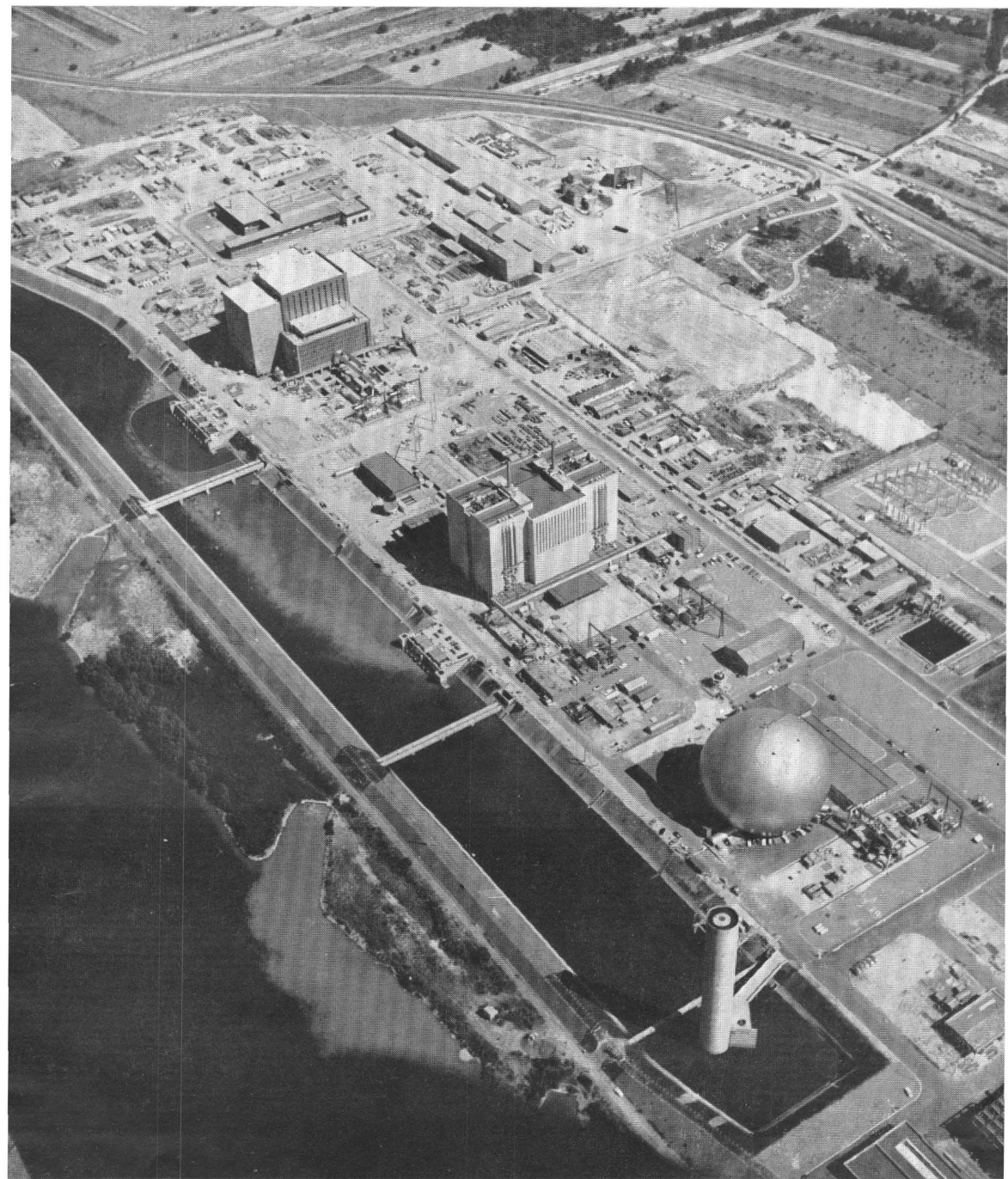
As far as industry is concerned, the Commission has been able to analyze the special issues bound up with the development of a revolutionary sector whose technical level reflects the Community's industrial potential. The Commission has, however, found that the necessary course of development is in fact bound to affect the entire existing industrial structure, in view of the close link between the nuclear sector and the other sectors of the economy.

The single Executive will pursue the operations launched by Euratom, which bear in particular on coordination of research, basic-material supply, industrial development and energy policy.

This is the background against which the Commission plans to devote the last few months of 1965 to summing up, in a single Community-level action programme, the developments which the further progress of nuclear energy will require.

The prosecution of research activities will thus constitute a facet of the general complex of economic and industrial problems with which the Europe of tomorrow will have to contend in its confrontation with the atom: the Commission will make it its business to underscore the part to be played in this process by concerted action at Community-level.

For this we pin our faith to the Community, whose course is now set for unification.



CHINON (France) — VIEW OF THE REACTORS EDF 1, EDF 2 and EDF 3

(See other side of page for caption)

EDF 1 reached criticality in August 1964 and was gradually run up to power during the last few months of the year. EDF 2 will be connected to the national grid early in 1965, as a result of which the installed capacity for nuclear electricity production in France will be brought up to 350 MWe. This capacity will be increased to 960 MWe in 1966 by the commissioning of EDF 3 and the Chooz power plant.

I. The Situation in 1964

1. During the year 1964 operations continued satisfactorily at four large-capacity nuclear plants in the Community. They are the power plants at:
- LATINA (Italy), rated power 200 MWe, owned by ENEL ⁽¹⁾;
 - GARIGLIANO (Italy), rated power 150 MWe, owned by ENEL ⁽¹⁾;
 - CHINON - EDF 1 (France), rated power 70 MWe, owned by EDF;
 - TRINO VERCELLESE (Italy), rated power 257 MWe, owned by SELNI ⁽¹⁾.

The Latina and Chinon plants are of the graphite-gas type; the former was built by a British group in conjunction with Italian industry, the latter by French industry. The Garigliano and Trino Vercellese plants, equipped with light-water reactors, were supplied by big American undertakings, although construction was carried out for the most part by Community industry.

Aggregate output of electricity at these installations during 1964 was of the order of 3,000 million kWh, representing 0.8% of all electricity generated in the Community. As regards the operational reliability of nuclear power plants, it should be noted that the Latina plant had a load factor during 1964 of 83% which went up to 98% for nine months of that year. Thus in the development of nuclear industry in Europe a new page—that of low- or medium-capacity reactors (G1, G2, G3, Kahl, BR 3)—has been turned.

2. In the course of the same year, the EDF 2 reactor (France), due for commissioning in 1965, with a rated power of 200 MWe, went critical on 18 August 1964.

In addition, construction of the following nuclear power plants is proceeding in the Community:

⁽¹⁾ By the terms of the law establishing ENEL, this company has assumed the rights and obligations of the companies SIMEA (Latina plant) and SENN (Garigliano plant). The formalities for SELNI have not yet been completed.

- Gundremmingen reactor (Germany), rated power 237 MWe, owned by KRB, due for commissioning in 1966 (boiling water string);
- Chinon EDF 3 reactor (France), rated power 480 MWe, due for commissioning in 1966 (graphite-gas string);
- Chooz reactor (France), rated power 266 MWe, owned by SENA (Franco-Belgian undertaking), due for commissioning in 1966 (pressurized-water string);
- St-Laurent-des-Eaux EDF 4 reactor (France), rated power 480 MWe, due for commissioning in 1968 (graphite-gas string);
- Doodewaard reactor (Netherlands), rated power 48 MWe, owned by GKN (limited company set up by the participants in S.E.P.), due for commissioning in 1968 (boiling-water string).

3. Moreover, in Germany it was decided to construct two new power plants, one of the boiling-water type at Lingen with a rated power of 240 MWe, including the 67 MWe fuel-oil superheating (owned by the KWL Company, scheduled for commissioning in 1968), the other at Obrigheim of the pressurized-water type with a rated power of 282 MWe (owned by the KWO Company, to go into operation in 1968).

These nuclear power plants in operation or under construction in the Community together represent a total of nearly 3,000 MWe, the graphite-gas reactors accounting for 1,515 MWe and the light-water reactors for 1,438 MWe.

Lastly, France has decided to build a number of nuclear power plants, including two units of 480 MWe each, construction of which will begin in 1965 at St-Laurent-des-Eaux and Bugey. The Fifth Plan laid down the rate of reactor construction at an average of 500 MWe a year, or 2,500 MWe during the five-year period. This figure may, however, be raised to 4,000 MWe under an optional programme. Furthermore, a joint Franco-German power plant is planned on the Rhine and a Franco-Spanish one of the same type (500 MWe) in Spain. The latter will be the first nuclear power plant originated by a Community country to be built outside the Community. In Belgium, apart from the participation with France in the 266 MWe nuclear plant under construction at Chooz in the Ardennes, two private companies are each contemplating the building of a nuclear power plant, one of which will be coupled to a pumping plant.

4. To complete the list mention must be made of the heavy-water reactors, installation of which is proceeding in the Community. They are the 50 MWe

heavy-water cooled and -moderated multipurpose research reactor at Karlsruhe and the EL 4 reactor at Brennilis (France), with a rated power of 75 MWe, both due for commissioning in 1966, and a 100 MWe reactor to be built by the KKN company at Niederaichbach (Bavaria) which should be operational from 1969 on.

Apart from the marine reactor destined for the experimental vessel "Otto Hahn", two further prototypes are being built in Germany. One, a 15 MWe high-temperature-gas-cooled reactor, is being built at Jülich by AVR (Arbeitsgemeinschaft Versuchsreaktor) jointly with the Brown Boveri/Krupp group, the other, a 20 MWe sodium-cooled zirconium-hydride-moderated reactor known as KNK, by Interatom at Karlsruhe.

5. Altogether, nuclear power plants in commission, under construction or planned at present represent 4,198 MWe, divided as follows:

Belgium	143 MWe
Germany	917 MWe
France	2,483 MWe
Italy	607 MWe
Netherlands	48 MWe
	<hr/>
	4,198 MWe

The breakdown by reactor type is as follows:

Graphite-gas	2,475 MWe
Boiling light water	623 MWe
Pressurized light water	805 MWe
Heavy water	225 MWe
Other converters	70 MWe
	<hr/>
	4,198 MWe

As regards the construction and fabrication industry, the year 1964 was full of promising events and developments. In the first place, German electricity producers, who form the biggest group of private electricity undertakings in the Community, definitely entered the nuclear scene with their decision to build the Lingen and Obrigheim power plants and with their plan to install the Franco-German plant already mentioned. The Lingen and Obrigheim light-water plants will be constructed almost entirely by Community, and in particular, German industry.

Attention may be drawn to the collaboration instituted between the CEA and a German construction firm in the field of the graphite-gas and heavy-

water-gas strings, and also to the relation established between that firm and French industries with a view to formulating a joint proposal for the Franco-German power plant on the Rhine. The fact that a large German enterprise and French firms have decided to work together cannot fail to underline the advantages of a concerted development of nuclear industry in the Community.

6. French industry furnished all the supplies for the graphite-gas reactors designed in France. It has succeeded in improving its fabrication techniques and in supplying reactor component assemblies.

Where light-water reactors are concerned, Community constructors are now able to meet turn-key contracts for large-capacity plants offering a number of guarantees. More and more often, equipment for these plants can be made in the Community. Thus 1964 saw the manufacture and delivery of the pressure vessels for the Chooz and Gundremmingen reactors, while the tenders accepted for the Lingen and Obrigheim reactors are almost entirely of Community origin.

But a number of problems still await solution as far as industry is concerned. These include the problem of fuel-element fabrication (guaranteed burn-ups) and, to a lesser extent, that of reactor core calculation and of control device fabrication. In France, two manufacturers were able to meet the needs of the domestic market for natural uranium elements, but in the other countries, which are concentrating on light-water reactors, the development of the market for fuel elements for this reactor type is still behindhand.

As a result, industry still lacks information and experience in this area. The Commission has pursued its efforts, in particular under its Participation Programme, to create a market and to provide for a degree of collaboration between manufacturers in the Community. It is also, by the conclusion of research and development contracts, carrying through its task of familiarizing the industries in the Community with these techniques by encouraging them to discover modern and original solutions. However the enriched-uranium fuel element industry cannot really get off the ground until the light-water reactors now operating have been reloaded with European fuel. One problem raised by fuel-element fabrication concerns the burn-up guarantees demanded by electricity producers. Here Community industry has to measure up to American industry with its longer technical and commercial experience and far greater financial resources to meet the financial consequences of any fuel-element failures.

In the Commission's opinion, it is on fuel-element fabrication that the greatest emphasis must be laid. If Community industry really wishes to play an important part, whether in respect of natural or enriched uranium elements,

the public authorities, the electricity producers and the manufacturers themselves must deploy all their efforts to reach joint solutions. With this in mind the Commission launched a study to seek a method of covering the financial risks resulting from the failure of fuel-elements fabricated by European firms.

7. In the course of 1964 the value of high unit capacities was confirmed. Nuclear power plants of 500 MWe and over, equipped with proven-type reactors such as can now be put under construction, will when commissioned (i.e. in 1969 at the earliest) and operating on base-load, bear comparison with the most modern conventional power plants of equivalent size used in the same conditions. The installation of units of that capacity means in the first place that the Community grids must be reinforced and secondly that the electricity producers must set up a load-sharing system to counter stoppages of such large units.

8. The industry of non-member countries represents serious competition with Community industry both within and outside the Community. The price schedule published during the year by a large American firm demonstrates its capacity to construct and mass produce high-power reactors and fuel elements.

It is evident from an analysis of the structure of the nuclear industry that:

1. it must be placed in the "basic industry" category, that is to say, among industries demanding very heavy capital investment;
2. the nuclear industry is one of the precision industries;
3. financially, it is among the industries which produce a high added value, i.e. the constructions it undertakes have an overall value when completed far in excess of the direct costs, the difference consisting in the cost of know-how and capital charges;
4. commercially, the nuclear industry deals with customers who demand very high quality.

Without a doubt, only very big undertakings, from the stand point of equipment and experience as well as of finance, can enter the nuclear field with a good chance of success. This is why the Euratom Commission has always stressed the need for concentrating the Community's nuclear activities. It seems to be hopeless for small- or medium-scale enterprises separately to attempt to compete against firms from non-member countries with any chance of making the grade. For them the future lies in a high degree of specialization and technological sophistication.

II. The growth of nuclear energy

9. The survey of the Community's long-term energy prospects published in 1962 by the Inter-Executive Group on Energy estimated electricity production from nuclear sources for 1970 at 20,000 to 25,000 million kWh, with installed capacity at between 3,500 and 4,000 MWe. In 1975 this figure, it was thought, would be between 10,000 and 16,000 MWe and in 1980 would reach the 40,000 MWe forecast by the Euratom Commission in its third Annual Report.

The growth curve would thus be:

Year	Capacity at 1 January (MWe)	Annual utilization time (hours)	Annual output (thousand million kWh)
1970	3,700	6,000	22
1975	12,000	6,000	72
1980	40,000	6,000	240

Extrapolation of these data suggested a nuclear electricity output of about 1,850,000 million kWh by the end of the century for an installed capacity of the order of 370,000 MWe.

The nuclear energy produced between now and the end of the century would total 17,000,000 million kWh. Moreover, nuclear plants in commission in the year 2,000 would still be able to supply a further 35,000,000 million kWh after that date.

Nevertheless, these long-term estimates quoted would appear already to need substantial revision. From paragraph 5 it emerges that nuclear capacity in 1970 can now be set at 4,200 MWe at least.

While awaiting the fresh estimates which the Commission proposes to draw up, those mentioned above may provisionally be taken, therefore, as the lower limit of the Community's future nuclear capacity.

The Europe of the Six depends largely on non-member countries for its energy supplies. Net imports of energy which before the second world war represented barely five per cent of overall requirements, will in fact need to cover half the demand in 1965 and probably two-thirds in 1975, in spite of the as yet small contribution of nuclear energy. In the longer term, the expected development of nuclear energy and of other sources of energy will at most suffice to bring imports back to the present percentage.

Nuclear energy is therefore essential to avoid reliance to an even greater extent on imports, which would jeopardize the dependability of supplies.

10. The prospects just outlined find further justification in the savings which may be expected from recourse to nuclear rather than conventional power plants. Comparison of the total costs of electricity from proven-type nuclear power plants and from the conventional coal and fuel-oil plants which would be commissioned in accordance with a corresponding programme by the end of the century points to a saving of at least a third in favour of the former. This comparison is based on the assumption that conventional fuel costs remain fixed at 13.50 u.a./tce throughout the period. This corresponds approximately to the present price of American Coal cif European ports, lying between the present price of fuel oil and of Community-minded coal. The basis of comparison selected is all the more conservative in that the cost of these fuels is more likely to rise.

11. Since the increase in energy requirements has gone appreciably beyond the original forecasts, it would seem that the above-quoted estimates of nuclear electricity output, large as they are, ought reasonably to be regarded as minimum figures for the Community.

Nuclear power plants will become competitive in respect of the base load as from 1970, and so it may be supposed—provided favourable conditions are created for the development of nuclear industries—that electricity producers will tend to expand to the utmost their nuclear electricity output capacity and that national or common energy policies will be aimed at encouraging a nuclear programme on an even wider scale than was expected.

12. One may wonder what will be the techniques chosen to attain these objectives. The possibilities are many and various, depending on the degree of success attained or drawbacks encountered at any given moment with the reactor types currently envisaged.

Today the best known types are the graphite-moderated carbon-dioxide-cooled natural uranium reactors and the boiling- or pressurized-light-water-cooled reactors using slightly enriched uranium; these may be considered to have reached the stage of industrial maturity and so are referred to as “proven-type” reactors. Neither past development nor the present position, however, warrants a definite decision in favour of one rather than the other and it would seem likely that they will remain level with one another until the end of the period in question.

Efforts are being made, however, to perfect new reactor types with better fuel utilization and higher temperatures so as to improve thermal efficiency.

These are the advanced converters, among which the heavy-water and high-temperature reactors call for special mention.

The heavy-water reactors are the only advanced converters which can run on natural uranium; moreover, their fuel consumption is low and they appear to be capable of using thorium. As to the high-temperature reactors, they present an interesting potential in regard to thermodynamic efficiency, thorium utilization and breeding.

Further ahead there will be the fast breeder reactors which will permit optimum fuel utilization by creating more fissile material than they consume and by making the most rational use of the plutonium produced in the proven-type reactors and the advanced converters.

13. The lines on which nuclear energy will develop cannot depend purely on the economics of a certain reactor type but must also be calculated to achieve optimum utilization of the fissile and fertile elements contained in the uranium.

For instance, recourse might conceivably be had in future only to proven-type reactors, in view of the favourable economic prospects they afford.

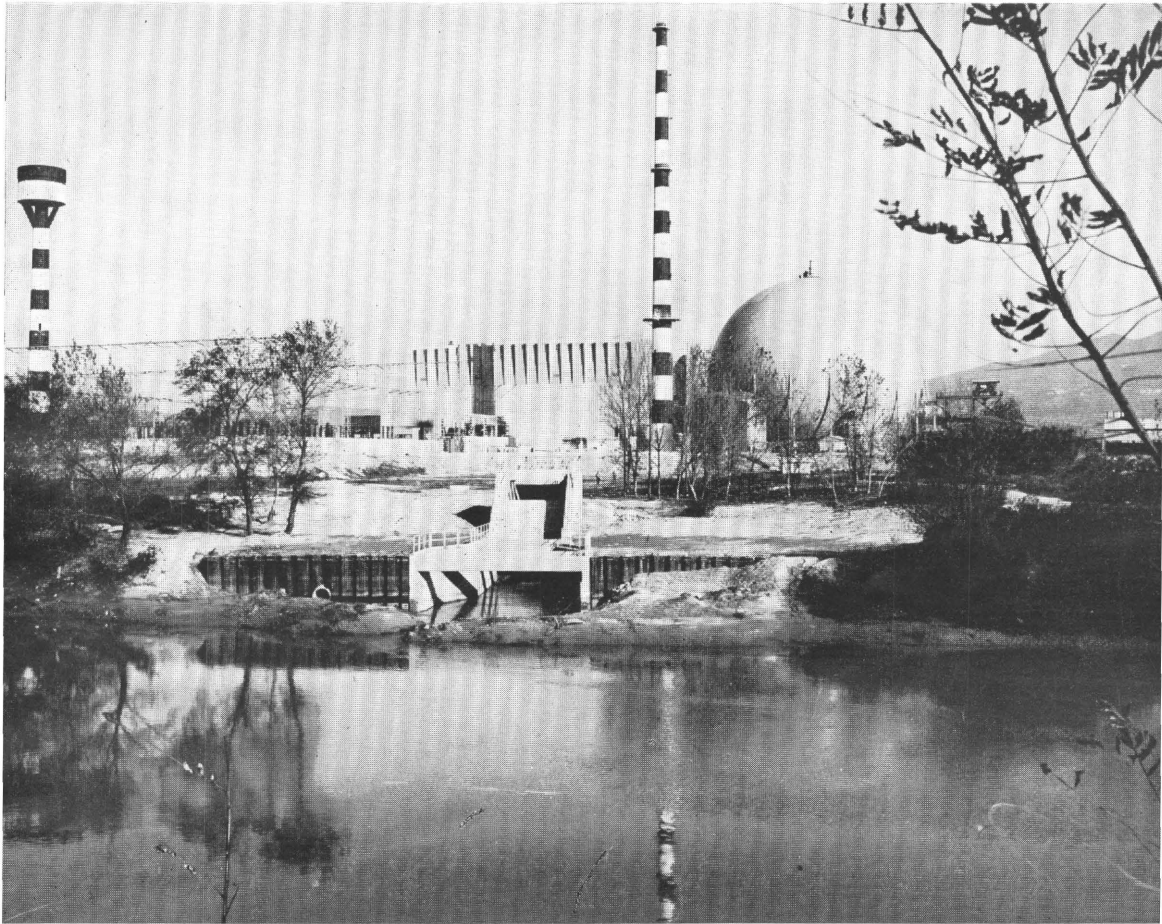
Yet there is no chance that this theory will be borne out, because it is devoid of interest from the angle of fissile materials requirements and methods of use.

In contrast, advanced converters and particularly heavy-water reactors will be operating within a few years under technically and economically favourable conditions and will partly replace proven-type reactors.

This development offers the following advantages: lower enriched natural uranium requirements, slightly reduced overall capital investment, less cost per kWh. However, it would seem advisable to plan for the construction of high-temperature reactors once evidence is provided as to their economics.

Absolutely rational use of the plutonium produced will not be feasible until fast breeders are in commission, but this drawback might be offset by recycling the plutonium in thermal reactors or by seeking sufficiently high burn-ups to permit of *in situ* combustion.

In the long term, optimum development consists therefore in a combination of proven-type reactors, advanced converters and fast breeder reactors, in the hope that, after an initial phase during which proven-type reactors will be supplemented by advanced converters, the fast breeder reactors will be technically perfected and more profitable economically than their predecessors. This formula is highly flexible and adaptable, for it leaves open the possibility



ITALY — GENERAL VIEW OF THE GARIGLIANO POWER PLANT (ENEL/SENN)

(See other side of page for caption)

In the course of 1964 the power plant was taken into service on an industrial scale; full power was reached on 23 May and the trials were completed in November.

The Garigliano power plant forms part of Euratom's participation programme.

of using high-temperature reactors, with the promise of very high conversion ratios and the prospect of fuelling with thorium.

This is the formula to which research and development programmes in the Community must be shaped. It is manifestly necessary to continue and extend activities in progress if the fast reactors are to come of age industrially in the allotted time and backed up in due course by a big programme of fast breeder reactor construction.

14. Deliberately leaving aside research on fusion, the Commission is counting on the success of the two major Community operations which are resolutely orientated towards the future, namely the ORGEL and DRAGON programmes and, a little further ahead, the fast reactor programme.

In so doing, the Commission aims at:

- making the best use of natural uranium resources and of the plutonium produced;
- reducing enriched uranium requirements to a minimum, in order to limit the Community's dependence in the event that enrichment capacity for the civil market should remain low or nil, or to minimize the investment needed if it were decided to build the necessary enrichment capacity within the Community;
- enjoying as soon as possible the advantages of fast breeder reactors which, by enabling uranium fission to be exploited to the utmost, represent the sole method so far known for ensuring energy supplies over a very long period;
- profiting from the potentialities of thorium for thermal breeders.

Generally speaking, it is reckoned that up to about 1975, nuclear capacity will consist mainly of proven-type reactors.

Starting in the second half of the next decade, they will be gradually supplanted by advanced converters, more especially heavy-water reactors, and from the eighties onwards by fast breeders.

The capital requirements for commissioning the nuclear power plants projected would amount to some 60,000 million u.a. up to the end of the century. In the course of their 30 years' life these plants could generate about 50,000,000 million kWh for a total cost of 140,000 million u.a. This would mean a saving of 120,000 million u.a. as compared with a non-nuclear programme of similar scope calculated on the basis of conventional fuels at a fixed price of 13.50 u.a./tce.

Natural uranium requirements, including the quantities necessary for enrichment, while appreciably less than for the other alternatives envisaged, would nevertheless amount to not less than 50,000 metric tons up till 1979 and 110,000 metric tons for the following decade. Between now and the year 2,000 the total works out at nearly 275,000 tons.

Enriched uranium requirements, on the other hand, remain within reasonable limits and will be further reduced if available plutonium is employed in thermal recycling until such time as it can be used in fast breeders.

As regards plutonium supplies, the quantities recovered from irradiated fuels (deriving from proven-type and heavy-water reactors) between now and the end of the century would be about 500 tons. The quantities needed for operating the fast breeders or bred in them have not been assessed.

Reprocessing requirements, in particular for the recovery of the plutonium present in irradiated fuels, are fast expanding to the point where the construction of large reprocessing plants is warranted.

III. Target programme and industrial policy

15. The considerations and findings set out above prompted the Commission to plan a target programme and lay down the principles of an industrial policy. Article 40 of the Treaty provides that the Commission shall, after consulting the Economic and Social Committee, periodically publish such programmes indicating production targets and investments in nuclear industries in the Community.

A target programme should be based on estimates of electricity demand and on the cost of the various forms of energy and in particular nuclear energy. It should give figures of aggregate capacity, numbers, unit capacity and commissioning date of nuclear power plants separately for each generation to be installed up to 1980, and it should make clear how this nuclear development affects such related activities as uranium extraction, isotope enrichment, fuel element fabrication and reprocessing, and heavy-water production.

Accordingly, the Commission last year set on foot preliminary studies which are now sufficiently advanced for it to contemplate submitting a first target programme to the Economic and Social Committee within the next few months. Since this is a matter which above all concerns nuclear industry in the Community, the Commission felt it necessary to discuss certain points of an industrial nature with representatives of the relevant sectors.

16. The findings pointed clearly to the need to formulate a coherent industrial development policy.

The opening up of vast markets for nuclear electricity, the desire of electricity producers to acquire reactors and the possibility for constructors to make profits do not in themselves suffice to guarantee that the industry in Europe will necessarily expand to the same extent as demand or exactly in accordance with the technical successes of which the industry must be assured.

Steps must therefore be taken to make good any shortcomings which might jeopardize the success of the Community's nuclear industry. Under the terms of Article I of the Treaty, it is Euratom's task to contribute to the creation of the conditions necessary for the speedy establishment and growth of nuclear industries.

The measures to be evolved and applied to that end, taken together, constitute the Community's policy for nuclear industry. The elaboration and implementation of that policy should proceed within the framework of general economic policy and also of the common energy policy of the member countries.

For this the Community's policy for nuclear industry has to do several things:

- it must see that nuclear activities, which engender industries of a high technical level, have their fair share in the overall industrial expansion of the Community;
- it must assist the development of a nuclear industry consisting of productive units of just the right size in relation to the market and ensuring that the capital invested is profitably employed;
- it must obviate the creation of bottlenecks by encouraging the establishment of adequate output capacities, the training of the necessary skilled personnel and the development of allied activities;
- it must bring advanced techniques to maturity in time to reap the maximum benefit from the nuclear resources available.

Because of the very diversity of industrial activities entailed in nuclear development, a division of labour can be planned to make optimum use of the possibilities available to the Community as a whole. These activities are of three kinds:

- of a general nature, relating to the preparation of sites and civil engineering;
- of a specifically nuclear industrial nature, in respect of power plant design, construction of certain reactor parts such as control systems, and fuel separation and reprocessing;

- of a conventional industrial nature but adapted to nuclear specifications, e.g. the design and supply of large steel pressure vessels or electronic assemblies for the specific types of reactor chosen.

Enterprises fitted to take on these tasks are not, of course, evenly distributed among the Community countries. The Community policy for nuclear industry must be so applied as to create or develop such capacity, bearing in mind first of all the need for concentration dictated by considerations of efficiency and profitability in industry and at the same time aiming at an equitable spread of achievement throughout the Community.

Faced with the competition of the huge industrial groups in non-member countries, Community enterprises can, indeed, only hope to conquer their own internal market if they present electricity producers with economically attractive tenders including guarantees comparable with those offered by their rivals outside.

While decisions to establish and operate nuclear industries are primarily a matter for the leaders of industry themselves, they may nevertheless be influenced, often decisively, by the adoption by the public authorities of a coordinated policy for industry.

Over and above those steps taken by local, regional, national and Community authorities, the time seems ripe for working out an overall nuclear industry policy which will measure up to present market prospects and to the competitive potential of third countries.

Such a Community industry policy will aim at organizing the administrative and legal infrastructure and the market for nuclear power plants, and will embrace reactor construction and supplies.

The Community's policy cannot be pursued in isolation, for its business is to coordinate and to integrate the various efforts undertaken at various stages of nuclear development and at various levels by the public authorities involved.

DEVELOPMENTS
IN NUCLEAR TECHNOLOGY
AND THE JOINT RESEARCH
PROGRAMME

I. Programme discussions

17. By its decision of 23 July 1962 the Council set a figure of 425 million u.a. as the ceiling for funds earmarked for the implementation of the Community's second research and development programme. This sum, supplemented by the various appropriations carried over, resulted in a final ceiling of 449,422 million u.a.

This amount was soon to prove too small to achieve the objects laid down, owing to the changed economic conditions in Member States during the years 1962 and 1963.

Prompted by the above-mentioned economic and technical considerations the Commission submitted a document to the Consultative Committee for Nuclear Research at its session on 12 March 1964, giving figures of the effect of changing economic factors on the second five-year programme, assuming the maintenance of the programme laid down by the Council on 23 July 1962.

Discussion within the Consultative Committee showed that the majority of Member States, rather than contemplate an increase in the budget proportionate to the decline in the value of money, preferred to have a completely revamped programme under which priority would be given to a limited number of projects.

Following on the Consultative Committee's advice, the Commission started discussions with the Council on adapting the second five-year programme to the trend both of economic circumstances and of nuclear developments. These discussions culminated in the decision taken by the Council of Ministers on 13 May 1965 to raise the ceiling of expenditure from 425 million u.a. to 430,578 million u.a. Cutbacks in the credits allotted to certain items of the programme made it possible to find an extra 34 million u.a. so that the appropriation for the priority projects could be stepped up. These increases relate mainly to the allocation for the Joint Research Centre, activities bearing on the ORGEL string, the fast reactor programme and work on controlled

thermonuclear fusion. A reserve fund of 3,078 million u.a., included in the total amount, is available to cover any insufficiencies in revenue, for the possible purchase of heavy water for the ORGEL programme and for any extension of the DRAGON project agreement.

II. Reactor development and allied research

18. Last year's Report (paragraph 15) outlined the four stages in the development of nuclear techniques, namely proven-type reactors, intermediate-type reactors, breeders and thermonuclear fusion.

These four broad phases form the basis of the Euratom programme as described below.

A fifth section affords a reminder that, alongside its main task of reactor development, the Commission has to make provision for a series of allied research projects which constitute an essential complement to the main programme or are directed towards canvassing prospects for the future. This covers the various operations connected with the fuel used in the reactor, with radioactive waste and radioisotopes, with marine propulsion, automatic documentation and scientific data processing.

A. PROVEN-TYPE REACTORS

19. Proven-type reactors are divided into two strings—the gas-graphite string and the light-water string.

The gas-graphite-natural-uranium reactor string is still the subject of an intensive research and development programme in the Community ⁽¹⁾. It is being conducted for the most part in France as part of the CEA's activities. The Commission, too, is engaged in development efforts in this field, chiefly centred on the improvement of certain reactor components and of fuel performance.

An example which might be quoted is the series of design studies to evolve more economic thermal insulation systems for prestressed concrete vessels than the one adopted for the EDF 3 and EDF 4 plants. This work has been entrusted to a number of enterprises in the various Community countries.

Alongside these research projects the Commission has signed a contract with ENEL covering an experimental programme for a very large number of measurements on the Latina power plant. Programmes of this kind carried

(1) See Chapter I on industrial progress and economic outlook in respect of this reactor string.

out elsewhere (Great Britain, USA) have proved their worth, for they make it possible to acquire a thorough grasp of how nuclear power plants function and of their true potentialities.

In view of the economic possibilities presented by light-water reactors and the decisions already taken by several large electricity producers in various member countries, it is to be expected that a considerable proportion of all nuclear electricity capacity to be installed in the Community during the next fifteen years will be accounted for by this type of plant. The important question then arises of counteracting the influence of powerful foreign enterprises on Community industry. Only if the industries concerned, the electricity producers and the public authorities pool their efforts will our nuclear industry be spared the fate of certain electronics and aviation concerns in Europe.

The Commission believes that the following objectives should speedily be laid down for the Community:

- establishment of a programme for building an appropriate number of power plants for the various proven-type strings in line with a timetable acceptable to the parties concerned;
- concentration of the technical and financial potential of the various industries in the Community into a limited number of large groups able to compete effectively with foreign industry and take the risks inherent in supplying nuclear plants under turn-key contracts;
- coordination at Community level of the requisite means for achieving the above two objectives (research programmes, taxation, facilities for finance etc.).

As far as its resources permit, the Commission has pursued its development programme for light-water reactors, launched in 1959. Last year eighteen research contracts were entered into. The results bear out the possibility of developing technically and economically sound European variants of the American-designed light-water reactor strings.

B. INTERMEDIATE-TYPE REACTORS

20. Fast neutron reactors will come to industrial maturity and start making their impact on the energy balance in the ten years 1980 to 1990. Meanwhile it is necessary for at least twenty years to resort to nuclear plants in which the fission reaction is sustained by moderated neutrons. In order not to jeopardize long-term supplies of nuclear source materials, it is important that the specific consumption of fissile material in reactors commissioned during

that period should be low and that they should enable large amounts of plutonium to be obtained by conversion of the fertile starting material. In this connection it must be emphasized, too, that the outlook for fast reactors is contingent on the production of a big initial stock of plutonium, which can only be provided in Europe through the prolonged operation of thermal reactors with high conversion ratios, such as heavy-water reactors. Thus even after fast reactors appear on the industrial scene, the most advanced types of thermal reactor seem certain to continue in operation alongside the new types for some years.

Let us now review in turn the heavy-water reactors, with the ORGEL string in the forefront for Euratom, the advanced gas reactors and lastly the aqueous suspension reactor project.

1. Heavy-water-moderated reactors

21. Quite apart from the fact that they may be fuelled by natural uranium like the gas-graphite reactors, which makes for flexibility of supplies, reactors employing a heavy water moderator offer three advantages for a long-range nuclear programme.

First comes their better neutron economy. This enables high burn-ups to be attained, which means low specific consumption of natural uranium.

Secondly there is their good conversion ratio. This makes it possible to obtain, from natural uranium, plutonium which can be used either to fuel breeder reactors or to generate extra energy by burning up part of it in the reactor itself.

Thirdly, because heavy-water reactors can use high specific power ceramic fuels, compact high-capacity units can be envisaged, which will mean substantial savings in capital investment.

The various coolants so far considered for this type of reactor are: pressurized heavy water, light water (either boiling or in the form of fog), carbon dioxide and organic liquids. Organic liquids represent one of the essential features of the ORGEL reactor. Pressurized heavy water as coolant is the solution adopted by the Canadians for the NPD 2 (Nuclear Power Development) reactor and the CANDU (Canadian Deuterium Uranium) reactor soon scheduled for start-up. Cooling by carbon dioxide is a European speciality, in view of the EL 4 prototype power plant now building in Finistère (France) and the German-designed KKN project. Research on light boiling water or fog as coolant is continuing under a contract with CISE (Centro Informazioni Studi ed Esperienze).

The ORGEL Project

22. Theoretical and technical studies are now well advanced, as is research on the behaviour of organic coolants. Results so far are very encouraging and promise well for the future of this reactor string.

The development of the ORGEL project still comprises three phases:

- construction of the ORGEL critical experiment, better known as the ECO critical assembly,
- construction of the ORGEL test reactor ESSOR,
- study of reactor string.

Construction of the ECO critical assembly has been held up by certain technical difficulties.

The second phase—construction of ESSOR—is continuing with the installation of the large assemblies; the ORGEL test reactor will probably go critical during the second half of 1966.

Reactor string studies, which are closely linked with work currently in progress, will assume still more concrete form as a result basically of experience gained with ESSOR. Research has also begun on the possible applications of ORGEL to industrial steam generating or desalination of water, either separately or combined with electricity production.

The technique has advanced to the point where construction of a prototype power reactor in Europe can be envisaged in the near future. At the same time the Americans have displayed renewed interest in the heavy-water-moderated organic-cooled reactor string. Common objectives of this kind could lead to collaboration between the Community and the United States in both research and industry.

2. Advanced gas-cooled reactors

23. A general description of this reactor string was given in the Seventh General Report. The Commission's activity in this field takes the form of participation in the DRAGON project in liaison with the European Nuclear Energy Agency and through an association with Brown Boveri/Krupp and the North Rhine Westphalia Nuclear Research Centre at Jülich for developing a pebble-bed reactor using thorium.

The DRAGON programme has yielded very satisfactory results to date. As regards fuel elements, it has led to the development of a fabrication technique by which extremely high burn-ups can be attained (around

100,000 MWd/t) without releasing excessive quantities of fission products in the primary circuit.

As work progressed, it became apparent that it was possible and economically worth while, even in the case of direct cooling by the primary circuit coolant, to dispense with the purge circuit. Other problems have found solutions, which, while still awaiting complete optimization, are nevertheless sufficiently advanced for an industrial-scale power plant to be envisaged in detail and the cost to be estimated.

Because of the very high power densities of advanced gas reactors, their excellent neutron economy (due to the almost total absence of structural materials other than graphite), the high temperatures accompanied by high thermodynamic efficiencies and the very compact heat exchangers together with the use — for the conventional part — of the most up-to-date turbines used in conventional power plants, it would appear that capital costs comparable with those for light-water plants may be hoped for, as well as fuel costs approaching those for natural uranium reactors.

From the standpoint of energy resources, these reactors open up prospects of employing thorium and promise very high conversion ratios.

Although the present experimental reactor is expected to provide answers to various engineering problems in the next few years along with a better understanding of fuel element behaviour, certain questions still call for more far-reaching study, notably that of fuel reprocessing.

At the same time it should prove possible through the association agreement signed by the Commission with the firm of Brown Boveri/Krupp and the Kernforschungsanlage at Jülich to develop a pebble-bed reactor using thorium, based on the principles of high-temperature gas reactors. A moveable fuel element in the core presents the dual advantage of eliminating difficulties connected with variations in the dimensions of the graphite and reducing to a minimum the need for an initial excess reactivity, thus affording better neutron economy. Notwithstanding the great interest which attached to the study of this type of reactor, however, certain engineering problems remain to be solved and the solutions devised could detract from the pleasing simplicity of the pebble-bed concept.

The programme pursued under this association, better known by the initials THTR (Thorium High Temperature Reactor) is subdivided as follows:

- research and development programme,
- design of power prototype of approximately 500 MWth,
- participation in the operation of the AVR reactor (Arbeitsgemeinschaftsversuchsreaktor) now building at the Jülich Nuclear Centre.

It is not impossible that high-temperature power reactors may in the end find a place halfway between the prismatic DRAGON design and the AVR pebble-bed concept.

*3. Aqueous suspension reactor project, Euratom/
Kema association*

24. The Commission's activity in this field continues under the association with KEMA which, it will be remembered, is mainly concentrated on a heavy-water-suspension design study. KEMA on its sole financial and technical responsibility has undertaken the construction near Arnhem of a prototype reactor based on this principle. For its part the Commission has participated in the related research and development studies without contributing financially towards building the reactor.

C. FAST BREEDER REACTORS

25. The year 1964 saw the continuance of the studies initiated at the beginning of the second five-year programme by the Commission in association with the national agencies at the Cadarache, Saclay and Fontenay, Karlsruhe, Bologna and Casaccia research centres. The Ispra establishment and the Transuranium Institute are cooperating according to their special qualifications. The work concerns design studies, research and development studies, as well as the perfecting of industrial prototypes planned for 1972-75 to be the forerunners of the big fast-neutron plants of the eighties whose prime virtue will consist in producing from fertile material (U238) more fissile material (plutonium) than they consume (i.e. breeding).

There has been rapid progress in the programmes of the Euratom/CEA (Commissariat français à l'Énergie Atomique) and the Euratom/GfK (Gesellschaft für Kernforschung) associations and each of them has prepared a first preliminary draft design of a 1000 MWe sodium-cooled reactor to serve as a basis for detailed optimization studies of industrial-scale power plants and later for preparing plans of the smaller-scale prototype plant intended to establish by 1975 the validity of the solutions adopted for 1000 MWe units. The Euratom/GfK association is also working on the comparison of sodium, gas and dry-steam cooling systems for this type of reactor. These studies will be buttressed by research to be carried out on large installations such as RAPSODIE, SNEAK, MASURCA and SEFOR.

The Euratom/CNEN association's own programme was directed to consideration of a reactor design using the U233-Th fuel cycle coupled with a novel fuel element array inside the reactor. However, it became clear that the

economic advantage of such a design as against the more conventional solutions with the Pu-U 238 cycle studied at Cadarache and Karlsruhe had little chance of outweighing the inherent difficulties. It was therefore decided to carry out the programme along new lines, integrating it more closely with the programmes of the French German centres. Several solutions are being contemplated.

26. The Community's research programme covers *inter alia*:

- The physics of fast reactor systems; for these studies the following devices have had to be installed:
 - SNEAK and MASURCA, fast neutron critical assemblies at Karlsruhe and Cadarache, will go critical mid-1966;
 - STARK, combined fast-thermal reactor at Karlsruhe, went critical mid-1964;
 - HARMONY reactor source at Cadarache, will go critical in mid-1965;
 - SUAK sub-critical pulsed assembly at Karlsruhe, started up end 1964;
 - SEFOR experimental reactor for studying the Doppler effect; undertaken jointly by the USAEC, Euratom/GfK association and Southwest Atomic Energy Associates (SAEA); this reactor, built by General Electric at Fayetteville (Arkansas, USA), will go critical during the summer of 1967.
- Coolant technology, which uses several large test loops:
 - 1 and 10 MWth sodium loops at Cadarache;
 - steam-generating sodium loop at Grand-Quevilly;
 - 3 MW steam loop at Karlsruhe;
 - several smaller loops at Fontenay and Karlsruhe.
- The technology of plutonium fuel elements, thorough studies on which are proceeding under the contracts of association concluded with the Fontenay and Cadarache plutonium laboratories, at the Transuranium Institute at Karlsruhe and at the GfK hot chemistry installations. The fuel specimens are irradiated in three test reactors—EL 3 at Saclay, FR 2 at Karlsruhe and BR 2 at Mol—and perhaps also in the Enrico Fermi Reactor at Detroit in the United States. The twenty MWth Rapsodie reactor experiment at Cadarache, which should go critical at the end of 1966, will also be available for irradiations of this kind. Construction of this reactor, which was preceded by fullscale testing of most of the major components such as the 1 and 10 MW circuits and the mock-up



MOL (Belgium) — GENERAL OF THE BR 2 MATERIALS-TESTING REACTOR

(See other side of page for caption)

The BR 2 materials-testing reactor (50 MW), which is operated jointly by the Belgian Nuclear Studies Centre (CEN) and Euratom, has been functioning since the end of 1962. The neutron fluxes produced in this installation are among the highest ever attained in any reactor. BR 2 is used primarily for studying the in-pile behaviour of construction materials and fuels. The photograph shows the reactor hall together with the "swimming pool" in which the reactor is installed.

Cadarache vessel, enabled Community industry to acquire valuable experience of a sodium reactor.

Work done in the Community now comes within the "agreement for exchange of information" concluded with the USAEC in May 1964; the agreement provides for the speedy exchange of documents between the various Community and American centres and for long-term staff assignments on either side. Under this agreement provision is made for the supply by the USAEC to the Community of 500 kg of plutonium for use principally in the SNEAK and MASURCA assemblies.

Talks were initiated in April 1964 with the UKAEA with a view to concluding an "exchange agreement" similar to the above. These negotiations are still meeting certain obstacles of a commercial nature which may perhaps be ironed out following the signature in February 1965 of a USAEC/UKAEA agreement in the same sphere.

D. CONTROLLED THERMONUCLEAR REACTIONS

27. It is scarcely necessary to dwell here on the goal of thermonuclear research or on its significance for the long-term development of nuclear energy. Precise statistics would be hard to come by but it can be estimated that, of the total effort expended in this field in 1964, laboratories associated or collaborating with Euratom accounted for 19%, the United States for 25%, the United Kingdom for 12% and the USSR for 35%, whose scientists are responsible for almost all new concepts (magnetic well configuration, turbulence heating, plasma formation by lasers, etc.).

The scope of Europe's efforts in this field is now comparable with what has been achieved in the USA already and in the USSR long since. Thus we are still in a stage of development and are about to get into top gear scientifically speaking. In 1964 the improvements introduced in certain experimental devices began in fact to produce results (four-pole coils on DECA II at Fontenay-aux-Roses), large installations (rotating plasmas in the Kruisvuur II device at Amsterdam, theta pinch: 2.6 MJ at Garching and 0.6 MJ at Jülich) came into service and new experiments (Hotice, plasma production by pulsed laser at Frascati) began to pay off.

A serious attempt has been made within the various groups and between the different laboratories at Community level to arrive at a better definition of future programmes and a more rational division of effort.

While there is no spectacular result to record, it is nonetheless true to say that in 1964 progress was constant on the scientific plane both inside and outside the Community. The organization and equipping of laboratories has

gone forward and should in the next few years lead to a substantial growth in Europe's contribution to research, always provided that activities under our association agreements can continue.

E. OTHER RESEARCH CONNECTED WITH REACTOR DEVELOPMENT

1. *Fuel fabrication, transport and reprocessing*

28. The Commission continued to attach the greatest importance to the fuel cycles for the various reactor strings. In this context, nuclear fuel fabrication techniques have been developed chiefly under research contracts. A number of specialized industries can now be said to have mastered the techniques sufficiently to go on to industrial-scale development of fabrication methods. A major effort is certainly needed to check the in-pile behaviour of fuel assemblies fabricated in the Community. These two points mainly concern ceramic fuel elements for light-water reactors. A distinctly more favourable situation prevails in regard to natural uranium fuel elements for gas-graphite reactors; France already possesses a production capacity capable of satisfying the Community's present requirements.

Turning to the question of fuel transport, the only practical problem at this stage concerns the carriage of highly-enriched uranium-based fuel discharged from materials-testing and research reactors.

Accordingly the Community is trying to work out a transport policy which will take advantage of existing storage pools, bearing in mind the incidence of transport costs on the economics of reprocessing in installations now under construction (Eurochemic, Eurex).

Last year the Commission's activities relating to irradiated fuel reprocessing fell under two headings, namely, negotiations of contracts for the reprocessing of highly enriched uranium fuel from the Community's materials-testing reactors, and the development of various chemical processes.

Under the first heading, in consequence of the negotiations with the United Kingdom Atomic Energy Authority and Eurochemic referred to in the Seventh General Report, the Commission was able to receive commercial tenders which are currently under consideration. In addition, talks with the CNEN on the Eurex project resulted in the signature of a convention linking the construction of a pilot plant with the carrying-out of a ten-year research programme on the development of aqueous processes for reprocessing fuel from materials-testing reactors and power reactors.

As to dry reprocessing development studies, the Commission continued with

the development of a method based on hydrofluorination, under a contract with the CEN. The main accent in this research is laid on the reprocessing of ceramic fuels (oxides, carbides). At present a small hot facility is being built to handle a few kilogrammes of low-activity materials. This installation, which will come into service during 1965, will be used to determine the decontamination factors for uranium and plutonium and to resolve any problems of chemistry and technology which may arise.

This activity has been sustained by the Commission since 1960 and seems likely to open up one possible way to the reprocessing not only of fuels deriving from fast reactors but also of ceramic fuels from thermal reactors. The latter conclusion is based on the recent United States decision to build a plant for processing this type of fuel, with a capacity of about one ton a day, working on the principle of uranium volatilization by hydrofluorination.

These facts constitute an encouragement to press on as speedily as possible with the research already in hand in the Community.

2. *Waste processing*

29. The Commission has made a start on the main lines of its programme regarding permanent storage of radioactive waste. Alternatives receiving careful study are:

- burial in derelict salt mines or pits dug in salt strata,
- surface storage in desert regions with minimal hydrographic system.

The first of these is under study in Germany while the latter is being explored by the CNEN in respect of Italy and of the desert islands in the Mediterranean basin.

As these research contracts were signed only recently, it is too soon to record any significant results.

3. *Radioisotopes and labelled molecules*

30. Over the past year the Bureau Eurisotop continued to promote the application of radioisotopes in industry. To that end it entered into fifty contracts for the development of apparatus, methods and substances connected with many sectors of industry which will help to solve numerous technical problems.

The Bureau seeks to coordinate to the fullest extent action by industry relating to the use of radioisotopes. Several study groups have been set up for the purpose. In the textile industry, for example, three hundred of the

biggest undertakings in the Community have taken part, with the assistance of some forty experts.

Besides the wide dissemination of numbers of documents the Bureau assisted in arranging exhibitions as well as organizing a number of conferences.

In the field of marked molecules for use in biology and medicine Euratom's work has entered a very active phase.

The award of some dozen research contracts has led to the development of more than sixty new labelled molecules. Thus the Universities of Heidelberg and Milan have prepared products for use in cancer research, and the University of Dijon, the University of Milan, and the Belgian Institut interuniversitaire des sciences nucléaires have prepared iodine-, carbon- or tritium-marked hormones for research in endocrinology and protein synthesis.

At the same time the University of Montpellier has developed labelled substances of cardinal importance for research into intermediate metabolism and for diagnosis; the Paris Faculty of Sciences has produced twenty stable-isotope-marked compounds for studies in molecular spectro-chemistry and the Collège de France has evolved a process for the biosynthesis of marked compounds using isolated organs.

Finally, the CEN at Mol and the Sorin and Montecatini companies have continued their researches on the production of marked compounds by original processes combining simplicity with cheapness.

4. *Nuclear ship propulsion*

31. Western Europe's interest in the use of nuclear energy for marine propulsion—which from the outset has figured in Euratom's programme of activity—has manifestly received fresh stimulus from the visit to European ports of the NS "Savannah", the first nuclear-propelled passenger/cargo vessel, and the Soviet Union's avowed intention of laying down further nuclear ice-breakers in view of the good performance of the prototype, the "Lenin".

Through a contract with the Gesellschaft für Kernenergieverwertung in Schiffbau und Schifffahrt mbH (GKSS), the Commission is participating in the design, construction and operation of the nuclear research ship "Otto Hahn" launched at Kiel in June 1964. The "Otto Hahn" is a 15,000 ton dead-weight 10,000 ship passenger/cargo vessel with a speed of 16.75 knots, intended for use as a "floating laboratory". Features of its pressurized-water reactor are the low primary pressure and the built-in steam generator within the pressure vessel. Possible savings in construction costs, weight and bulk with this design were considered only insofar as they would not impair experimental research.

Under Euratom's contracts of association with RCN (Reactor Centrum Nederland) on the one hand and the Italian Fiat and Ansaldo firms on the other, the design of ships reactors of an advanced type is being studied. Furthermore, the Commission is collaborating with the above contractors on the optimization of safety measures on the basis of experimental and theoretical studies bearing on naval architecture, with special reference to anti-collision structures, mechanical resistance of the components and the nuclear plant, and shielding against ionizing radiations.

The results of these studies when compared with experience gained in the course of designing, constructing and operating the "Otto Hahn", will make it possible to assess the risks still to be reckoned with as regards profitability of this method of marine propulsion.

5. Irradiation

32. Irradiations are assuming ever greater importance as nuclear industry develops, and the Commission has always sought to ensure that the Community possesses the requisite means to test out the irradiation behaviour of the materials destined for use as components in the various reactor projects. It has two very high neutron flux reactors available for the purpose—the BR 2 at Mol operated jointly with CEN, and the HFR, technical management of which it has entrusted to RCN.

Both these reactors operated normally during the year apart from a few brief shut-downs at BR 2 due to unscheduled control rod insertions. Irradiation operations proceeded smoothly for account of outside users as well as Community bodies. Studies are in hand for improving the technical characteristics of these installations, in particular for stepping up the power of HFR.

6. Plutonium and transplutonium elements

33. Research into plutonium recycling in thermal reactors proceeded as one of the main objectives of the Euratom/US Cooperation Agreement. The scope of research has been considerably amplified as the result of two important contracts signed with the CEN/Belgo-nucléaire association and the CEA. The extent and utility of these studies has made it possible to institute valuable exchanges of technical information both with specialist American laboratories and with the UKAEA.

The Commission believes that all this research work in the Community, Great Britain and the United States—accessible to us through the various information exchange arrangements—will in due course yield sufficient technical

and economic data for the formulation of a policy governing the use of plutonium stocks which are liable to increase rapidly in the Community from the next decade onwards.

7. Nuclear measurements

34. Reactor research and development calls for ever more exact knowledge of neutron data. The quantity of such information is expanding owing to the Community's interest in the fast reactor development, which demands a good knowledge of neutron data in the resonance zone as well as of fast neutron scatter, in respect both of fissile and of structural materials.

The Van de Graaff accelerator and the Linac linear electron accelerator are employed for this purpose. The former has been in commission for a year, while the latter is undergoing trials. Their range of use has been widened by a teleprocessing system installed at the end of 1964, linking the CNMB by permanent telephone line with the Ispra establishment, so that the CETIS machines can immediately handle nuclear data obtained by the accelerators.

Collaboration between the CNMB and standards bureaux both inside and outside the Community again proved very fruitful. A particularly good instance is provided by the European American Nuclear Data Committee; it was, of course, in very close liaison with EANDC that the programme of the Euratom establishment was drawn up.

8. Scientific data processing

35. The installations of CETIS (which is itself a part of the Ispra establishment) form one of the most powerful electronic computer groups in the Community and their importance for a research centre like ours can hardly be over-emphasized.

While expanding its essential scientific activities as the computer centre for nuclear problems and automatic processing of scientific data, CETIS continued to cooperate with administrative departments of the European Communities and with Community institutions which find its electronic machines exceedingly useful, especially in the field of statistics.

36. The significance for industry of the various research activities described in the foregoing chapter needs no underlining. Nevertheless the task of investigating and experimenting with the different reactor strings and improving their performance is not in itself enough and has to be extended in various areas, the most important of which are experimentation with power plants on a large scale, especially within the framework of the participation programme, and the elaboration of a system of rules and of legal and institutional machinery appropriate to the specific nature of nuclear development.

With regard to the supply of ores and nuclear fuels to users, the Commission has taken the initiative provided for in Article 76, para 2, in putting before the Council proposals for the amendment of Chapter VI of the Treaty. Such proposals, drawn up in the light of experience, should make for the more flexible operation of the Agency, originally designed to cope with a fuel shortage.

I. Nuclear power plants

37. As in previous years, the Commission's activities in this field hinged on the programme instituted under the US/Euratom Cooperation Agreement and the programme for participation in power reactor construction in the Community.

In this context it is to be noted that, under Article 45 of the Treaty, the Council in 1964 granted joint enterprise status to a third undertaking and is presently considering a fourth application.

1. *Programme of the US/Euratom Agreements*

38. At present there are three nuclear power plants participating in the power reactor programme under the US/Euratom Cooperation Agreement, namely, the Società Elettronucleare Nazionale, the Société d'Énergie nucléaire france-belge des Ardennes and the Kernkraftwerk RWE - Bayernwerk GmbH.

The first of these (SENN), now operating industrially, has attained a slightly higher capacity than the 150 MWe net contracted for.

A research and development programme established jointly by SENN and General Electric is in hand, to obtain fuller knowledge of the behaviour of this plant and of boiling water plants generally. Depending on the results of this programme it may prove possible to boost the reactor and the power plant output considerably.

Construction of the other two power plants, belonging to the Société d'Énergie nucléaire franco-belge des Ardennes (SENA) and the Kernkraftwerk RWE - Bayernwerk GmbH (KRB) respectively is proceeding smoothly and they are both due to attain full capacity by the end of 1966.

Turning to account advances in pressurized-water reactor design, SENA has designed its installations in such a way as to step up plant capacity to 266 net MWe. For this purpose the enterprise and its main suppliers intend to resort in particular to the "chemical control" system.

At SENA's request, Euratom is currently examining, in accordance with the basic contract concluded with that enterprise, the possibility of accepting these new specifications under the joint power reactor programme. Evaluation studies are expected to continue throughout 1965.

In addition, fuel supply contracts were signed in December 1964 by the Supply Agency and the USAEC on the one hand and by SENA and the Agency on the other.

39. Regarding implementation of the US/Euratom Cooperation Agreement the USAEC has notified the Euratom Commission that the chemical reprocessing services provided under the joint power reactor programme will cease to be available after the coming into service of the plant belonging to the private American company Nuclear Fuel Services Inc. (NFS), scheduled for 1 January 1966, unless it is established to the satisfaction of the USAEC that these fuel reprocessing services are unobtainable from commercial installations on reasonable terms and conditions. Should that be the case, the USAEC would agree to undertake or arrange for chemical reprocessing of used fuel from reactors covered by the joint programme or from reactors using enriched uranium supplied under the Supplementary Agreement.

The USAEC expects the development of a chemical reprocessing industry subject to commercial competition to lead to a reduction in fuel cycle costs similar to the diminution in capital and operating costs brought about by the severe competition among reactor constructors.

2. Participation programme

40. The object of the participation programme launched under Euratom's first five-year programme was to encourage the construction of proven-type nuclear power plants and to collate and disseminate the results of experience gained in the design, study, construction, testing and operation of such plants.

Five contracts, to the tune of 32 million u.a., have been signed between the Commission and Community enterprises for implementing the participation programme.

This appropriation enables the Commission to participate, up to a specified figure, in the contractors' costs and expenditure viz. cost of start-up, fuel fabrication costs and cost of manufacture of reactor components.

The five enterprises with which the Commission has concluded participation contracts are as follows:

- Società Elettronucleare Nazionale (SENN), in respect of the Garigliano power plant;
- Ente Nazionale per l'Energia Elettrica;
Impresa già della Simea S.p.A. (ENEL/SIMEA), in respect of the Latina plant;
- Société d'Énergie nucléaire franco-belge des Ardennes (SENA), in respect of the Chooz plant;
- Kernkraftwerk Rheinisch-Westfälisches Elektrizitätswerk, Bayernwerk GmbH (KRB), in respect of the Gundremmingen plant;
- N.V. Samenwerkende Electriciteits-Productiebedrijven (SEP), in respect of the Doodewaard plant.

Changes in the statutory position of two of the Euratom contractors—SENN and SEP—were announced early in 1965.

SENN has been nationalized. The Italian presidential decree concerning the transfer of this undertaking to ENEL was published on 5 February 1965.

As regards the SEP project, a company was formed at the end of January 1965 entitled "Gemeenschappelijke Kernenergiecentrale Nederland N.V." (GKN) which proposes to construct and operate the Doodewaard power plant.

In consequence the rights and obligations arising under the participation contracts signed by Euratom with SENN and SEP will be transferred in their entirety to ENEL and GKN respectively.

41. The situation in regard to these five projects comprised in the participation programme at end 1964 is outlined below:

The Garigliano testing programme has been concluded and the plant has now been operating industrially for about six months, delivering some 680 million KWh to the grid.

The Latina plant operated normally throughout the year and has produced approximately 1,500 million KWh. Refuelling commenced in September.

At the Chooz plant, the excavation and concreting of the galleries and caverns has been completed. The reactor vessel has been delivered and equipment fabrication at works is proceeding according to plan. Mid-1966 is the scheduled criticality date.

Civil engineering work has forged ahead at Gundremmingen. Construction of the containment is complete and leak-testing has been successfully carried out. Equipment fabrication at works is proceeding normally. The reactor is due to go critical in May 1966.

On completion of the detailed design studies for the project, a definite decision was taken to construct the Doodewaard power plant and at the same time the above-mentioned GKN company was constituted. Preliminary site preparation has already started.

In respect of its participation in these projects, the Commission has already agreed to a total of 3,762,835 u.a. It will be recalled that the major part of its contribution of 17 million u.a. is only due on the proviso that the reactor core fuel elements are fabricated in the Community.

In return for its participation, Euratom obtains from the contractors as well as from engineers assigned to the contractors information on the design, construction and start-up of the five power plants.

This information which is transmitted on a regular basis, is supplemented by the engineers' reports from certain bodies and enterprises and from students in the Community who are enabled to visit these power plants with a view to acquiring first-hand information on specific points.

The value of this type of assignment for engineers can hardly be exaggerated, in that it provides them with an opportunity of gaining the most valuable fund of experience. Naturally it is during the period of final trials and start-up that applications for secondment are most numerous, but various bodies and enterprises have on several occasions renewed staff assignments even during periods of normal operation.

Information is disseminated by means of technical information gatherings, papers and publications. It is likewise possible to consult the documentation held at Headquarters and to obtain microfilms. By these means Euratom reaches a wider audience each year.

3. *Joint enterprises*

42. The Community encourages industrial development by granting joint enterprise status to “undertakings of fundamental importance to the development of nuclear industry” (Article 45 of the Euratom Treaty).

A “joint enterprise” is a legal person under European law. The status thus conferred has a dual advantage: they are not bound by the national provisions governing the particular legal forms applying to joint stock companies, and they can enjoy the advantages set forth in Annex III to the Euratom Treaty (with particular reference to exemption from taxation and customs duties). This latter consideration was the major reason for forming the three joint enterprises now in existence.

The only undertakings which have so far applied for and been granted joint enterprise status are nuclear power plants. They satisfy the requisite conditions in that their construction enables the capacity of nuclear industry to be utilized and developed, and the experience gained in setting up a nuclear power plant stimulates progress in that industry. With these considerations in mind the Council, having in previous years already granted the Chooz and Gundremmingen power plants joint enterprise status, in 1964 conferred the same status of the Lingen power plant and took note of a fourth application relating to the Obrigheim plant.

The Lingen plant is being erected in north-western Germany (Lower Saxony), north of the Ruhr. Two-thirds of the capital belongs in approximately equal parts to two associated companies—the Vereinigte Elektrizitätswerke Westfalen (VEW), an electricity supply undertaking belonging to the local authorities which serves part of Westphalia and the Ruhr, and the Allgemeine Elektrizitäts-Gesellschaft (AEG). The other third is divided among five banks, which intend to withdraw from the enterprise later.

Construction work on this plant—due to come into service in 1968—began on 1 October 1964. It is being carried out by AEG which, in assuming such a task for the first time, will take its place among European enterprises with experience in this field. A relatively large number of undertakings in the Community will participate in the work as sub-contractors. On the other hand, AEG will have only limited recourse to supplies or licences from countries outside the Community. This will therefore be the first boiling-water reactor to be built by an enterprise in a Member State, with negligible outside help.

In the spring of 1964 the Kernkraftwerk Obrigheim GmbH (KWO), formerly Kernkraftwerk Baden-Württemberg Planungsgesellschaft mbH, informed the Commission of its desire for joint enterprise status and the

advantages relating thereto in respect of the nuclear power plant which it proposes to construct. The Commission is at present considering the power plant project, work on which is expected to start in the spring of 1965 for commissioning in 1968. The Obrigheim plant will be constructed in Baden-Württemberg.

The KWO company was formed with the participation of thirteen small and medium-sized electricity undertakings in Baden-Württemberg. The plant will be equipped with a pressurized-water reactor. Construction is in the hands of Siemens-Schuckertwerke AG, which will obtain the assistance of other Community undertakings and will only to a limited extent draw on supplies and licences from non-Community countries.

II. Legal and institutional infrastructure

43. The use of nuclear power can only become really widespread if a whole complex of obstacles is first eliminated, ranging from the apprehensions linked with the possibility of nuclear accidents to uncertainty as to future availability of the experts and equipment needed for the construction and operation of power plants. Another point is the need to lay down effective provisions in respect of industrial property and safeguards and controls.

1. *Third-party liability and insurance*

44. With a view to facilitating the conclusion of insurance policies in the nuclear sector, the Community is engaged in a twofold task: it is helping to establish and bring into line legal standards appropriate to nuclear requirements, and is sharing in the development of nuclear insurance and the elaboration of terms of insurance compatible with the general interest.

Ratification of the 1960 Paris Convention and of the Supplementary Convention signed in Brussels in 1963 has been delayed by the conclusion of the negotiations relating to the Vienna Convention which diverges from the two European Conventions on certain points. In January 1964 two additional protocols to the European conventions were signed. They had been drawn up with the help of Euratom and are designed to align the European conventions with the Vienna Convention so that countries can accede simultaneously to all three. The Commission has called on Member States to ratify the Conventions and put them into force with all speed while pressing forward with the coordination of their respective national implementing legislation so as to obviate the distortions in competition which would arise from disparities between the differing systems of third-party liability.

The Commission is at present collaborating with Community insurers in drawing up common rules for insertion in insurance policies covering third-party liability in respect of fixed nuclear installations. Moreover, in the Commission's view, the harmonization of laws implementing the Paris and Brussels Conventions is a matter of urgency. In response to the Commission's initiative, Member States have agreed to a further standardizing effort and in particular to a comparison of draft ratification and implementing legislation at present under study.

2. Commercial policy

45. In this field the Commission's activity has centred on the preparations for the Kennedy-round negotiations under GATT.

Since nuclear products are covered by the Community's common customs tariff, there has been close cooperation between the Euratom Commission and the EEC Commission regarding the system applied to nuclear products in the negotiations.

As regards industrial products, the key problem was to draw up a restricted Community list of exceptions, that is to say, of products to which the across-the-board cut in rates of duty will not apply.

Export opportunities will fairly soon assume great importance for the development of Europe's nuclear industry. Successful conclusion of the Kennedy-round negotiations should enhance future export prospects and the Commission therefore came out in favour of including nuclear products to the fullest extent compatible with the future interest of the European nuclear industry which, in accordance with the Treaty, it is concerned to develop.

At its session from 11 to 15 November 1964 the Council of Ministers decided against consolidation of duties on nuclear source materials, in favour of maintaining duties now in force on reactors and fuel elements, while prolonging, however, their suspension until 31 December 1966, and of placing a small number of non-ferrous metals on the list of exceptions.

The final result will depend on the course of the negotiations.

3. Dissemination of information and industrial property

46. Non-patented information deriving from Community research continued to be circulated in accordance with the Commission's policy statement to the Council of 1 August 1963.

That policy is aimed at ensuring for Community industries prior or even exclusive rights in the exploitation of information of industrial value arising out of the implementation of the research programme. This non-patented industrial information is published only where there is no risk of depriving Community industries of priority of use. So far rather more than 200 persons and undertakings in the Community have asked for access to such restricted industrial information.

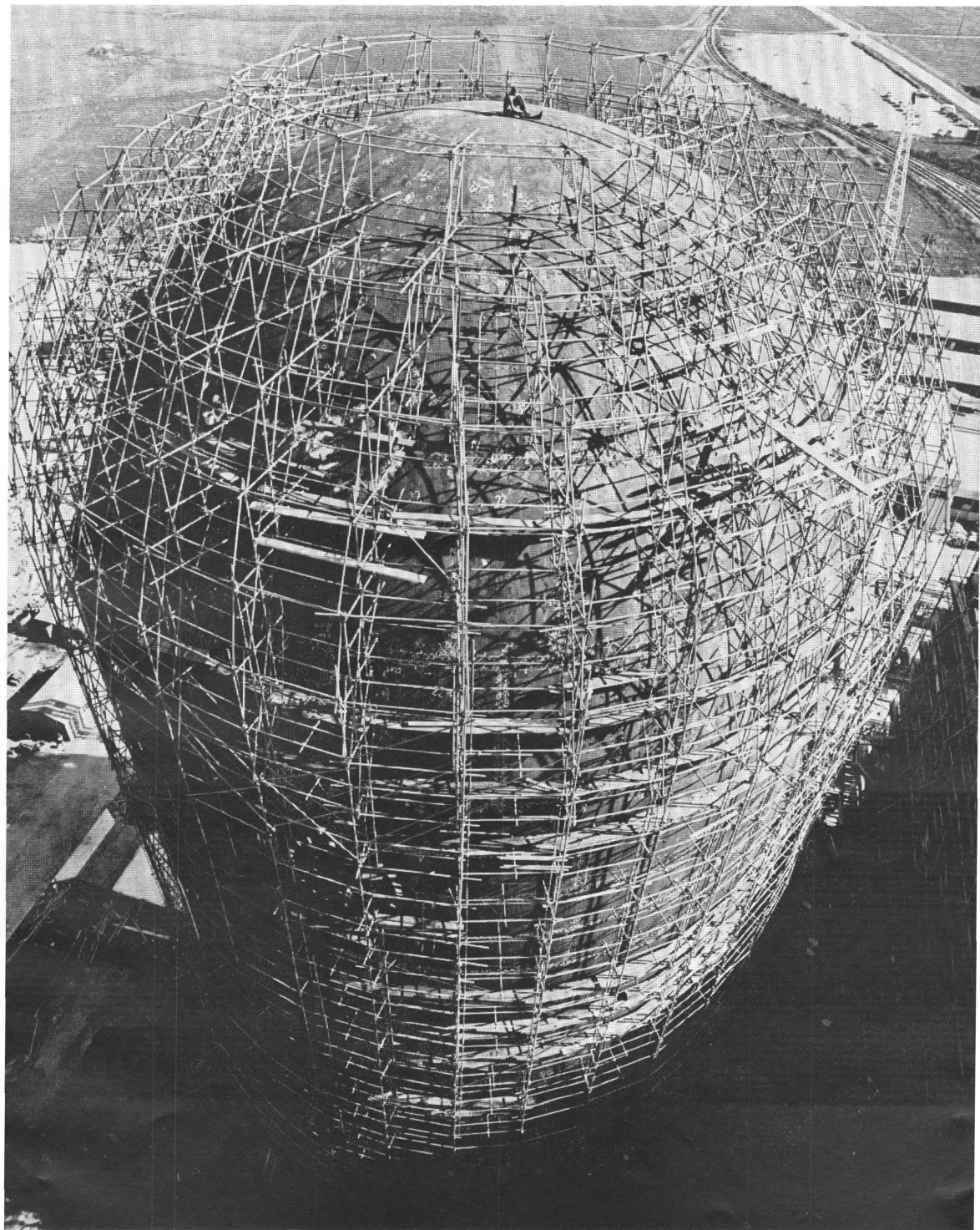
The Commission's portfolio of patents and licences is now expanding steadily, although it would be premature to assess the consequences of its possession for the protection of Community industries, since in the first place most of the specifically nuclear inventions will be exploited only when reactors currently in the design stage can be built, while secondly the full worth of patents is realized only in conditions of intense competition, which do not yet obtain on the nuclear market. On the other hand, negotiations have been entered into with a view to a licence for some dozen patented inventions in fields not restricted to the nuclear sphere, the marketing of which involves only limited development costs both in time and money. In six cases the negotiations have resulted in the granting of a licence; in the others the negotiations are still in progress. In view of the rule embodied in the Rome Treaty forbidding exclusive licences, be it noted, it is not always easy, particularly for small and medium firms, to grant them. Since an undertaking of this kind is more vulnerable to competition, an exclusive licence to work its patent provides an additional guarantee before further capital is invested.

The industrial property clauses in research contracts remain unchanged, both as regards patentable inventions and know-how. These rules are proving suitable for maintaining the balance between the rights of the Community and the interests of its contractors; they facilitate cooperation with industry and make for effective exploitation of research results. It is noteworthy that other national and international bodies tend more and more often to follow the same lines when choosing a model research contract.

4. Safeguards and controls

47. While the purpose of the safeguards system is the same as in previous years, the situation to which they apply is evolving along with the development in nuclear activities.

For the moment it is the transition from the research phase in the Community's nuclear activities to the industrial phase which most affects the exercise of safeguards. The number of installations subject to inspection is no longer rising as quickly as during the period when the research infrastructure was being laid down. On the other hand, nuclear materials, particularly special



GUNDREMMINGEN (Germany) — CONTAINMENT SHELL OF THE
KERNKRAFTWERK RHEINISCH-WESTFÄLISCHES ELEKTIZITÄTSWERK /
BAYERNWERK (KRB) POWER PLANT

(See other side of page for caption)

Construction of this 237 MWe nuclear power plant is an advanced stage : in August 1964 the containment shell successfully underwent the second pressure test; the steam generators are on site and the reactor vessel is due to arrive shortly. The first criticality of the reactor is scheduled for May 1966 and the commissioning of the plant for the end of that year.

The KRB nuclear power plant forms part of Euratom's participation programme.

fissile materials, are increasing in quantity at a faster pace, which reflects the progress in commissioning of power reactors.

Community industry has applied itself to satisfying the needs of research installations to an even greater extent. In this connection the initial charge for research reactors was in almost every case imported in the form of fuel elements. Today, enriched uranium is frequently imported in the form of metal ingots or slabs, or even in the form of uranium hexafluoride, a still less refined product, from which the metal and fuel elements are made. Consequently these materials pass through a process which is at once longer and more complicated from the safeguards angle.

To the various stages in the fuel fabrication cycle is to be added the reprocessing of irradiated fuel, which will shortly become practicable in the Community. The US/Euratom Cooperation Agreement as amended on 22 May 1962 opens the door to reprocessing such materials within the Community. This entails applying the safeguard and control guarantees provided for in the US/Euratom Cooperation Agreement and lends special significance to the implementation of the provisions of Article 78, second paragraph, of the Treaty, regarding approval by the Commission of reprocessing methods. Hence the conditions exist to permit of reprocessing, in the installations thus approved, enriched uranium fuels of American origin irradiated in reactors in the Community, whether such materials were originally delivered under bilateral agreements with Member States or under US/Euratom Cooperation Agreement.

The Cooperation Agreements between Euratom and non-member countries continued to gain importance in the field of supplies. The quantities of materials delivered under these agreements have been constantly rising both as to absolute value and as compared with the amounts imported under bilateral agreements concluded by Member States. As was the case last year, these materials are intended first of all for the fast reactor programme and for power reactors. An essential condition for obtaining these materials and the specific equipment for power reactors from non-member countries has been that the Commission should possess an effective system of safeguards and controls adequate to ensure compliance with the guarantees underwritten by the Community.

By measures introduced to rationalize both the internal organization and the inspection procedure over the last few years it has been possible to deal with the increasing pressure of work without requiring extra staff. The most tangible result is that it was found possible to step up the number of inspections—which constitute one method of control and by no means the least important—by 44% in 1964 and that a similar improvement on 1964 is likewise forecast for 1965.

At the same time, the Commission is trying to work out and implement new methods for the physical control of nuclear materials. These new techniques make for greater speed and accuracy with the dual aim of maintaining maximum efficiency of control while subjecting the enterprises involved to minimum interference.

Lastly, the Euratom Commission, in accordance with the terms of the European Parliament's resolution on the Fifth Euratom Report, has elaborated a system of special statements in connection with the implementation of Article 84 of the Treaty. The system accords fully with the Treaty and with Regulations Nos. 7 and 8. A communication on the subject was addressed to the Member States and it is at present being applied. This system serves to reconcile defence needs with the obligations laid down in Chapter VII of the Treaty.

In conclusion, the Commission has every reason for satisfaction in its possession of a control system now fully put to the test after six years in operation, applied to 168 undertakings covering the entire range of the Community's nuclear activities. From that aspect the system appears to be unique and has won recognition from non-member countries as an effective means for backing up the commitments entered into by the Community.

5. Relations with industrial federations, employers' associations and labour unions

48. During the past year, contacts were maintained with industrial Federations, associations of electricity producers, industries producing electricity for their own consumption, nuclear equipment manufacturers and all organizations whose object is to promote the use of nuclear power.

The Commission noted the views of UNICE on the question of duties to be proposed for nuclear products in the Kennedy-round negotiations.

A round-table conference with labour union leaders in the Community was held from 20 to 22 May 1964 in Stresa. Leaders of national and European trade union organizations attended and held wide-ranging discussions on the problems which the industrial exploitation of nuclear energy raises for workers. Practical methods of closer cooperation between the Commission and the trade union organizations were examined and defined with a view to instituting a mutual supply of information and effective consultations on such matters as the economic consequences of nuclear energy and the problems of using radioisotopes in industry.

Following the Stresa round-table meeting, a liaison committee for contacts between Euratom and the labour organizations met to consider the fields

in which the social and economic studies for determining the social effects of nuclear industry should first be launched. Three lines of study were given priority by the liaison committee, namely, nuclear economic structures, economic and social aspects of the use of radiation techniques, and the effects of nuclear development on conventional industrial activities; these received detailed consideration by the relevant Euratom Departments and trade union experts' panels. The studies proposed on this theme will be conducted in close collaboration between the Commission and the representatives of the trade union organizations.

The process of keeping workers informed, essential of nuclear activities are to take their place without friction in the general economy of the Community, continued as in previous years.

As regards the social effects of nuclear energy, the Commission carried out a pilot survey, with the help of the Institute of Sociology of the Free University of Brussels, on qualifications and scientific and technical staffing needs in the nuclear sector in Belgium.

The Commission's information activities were pursued both at Community and at national level in collaboration with the Joint Press and Information Service. The increased familiarity of persons taking part in visits and tours arranged by the Commission with the basic principles of nuclear energy has made possible some degree of specialisation.

III. Supply

1. Joint supply policy

49. The drawing up of the first target programme as provided for in Article 40 of the Treaty brought out the need for a joint long-term policy to cover the supply of all nuclear fuels. Such a policy is linked with industrial policy and must be integrated into energy policy. During the past year the Commission has continued to work towards the establishment of a joint nuclear fuel supply policy.

As the Commission has several times pointed out, the Community's future natural uranium demand will be considerable while its own known reserves are very limited.

In its memorandum to the Council in November 1963, the Commission argued in favour of Community industry's acquiring its own resources by prospecting operations and by participation in non-Community enterprises under a joint policy. At the beginning of 1964, in an Opinion addressed to Member States

pursuant to Article 70 of the Treaty, the Commission stressed the need for Community industry to undertake a large-scale exploration effort in the near future (cf. Seventh General Report).

At world level, the Third Geneva Conference confirmed the need to step up the uranium prospecting effort to gain more information on reserves which can be worked cheaply. The Conference discussions gave grounds for reasonable optimism regarding the discovery of new deposits provided that industry takes this necessary coordinated action without delay. Notwithstanding the large domestic reserves and stocks in the United States, the accent there is already on long-term uranium supply and on putting national resources to good use. Hence the USAEC attaches great importance to the commissioning of advanced converters pending the entry into service of fast breeders. The scope of the studies devoted to these strings in the joint research programme likewise bears witness to the Community's concern for optimum use of nuclear fuel resources.

50. To determine the areas suitable for exploration and the extent of the respective campaigns ⁽¹⁾, the Commission first of all reviewed Community territory. Accordingly it instructed the Agency to set up a working party attached to its Consultative Committee with the following tasks:

- to prepare an inventory of uranium prospecting in hand within the Community according to country and geological region;
- to draw up a general survey of regions in the Community where exploration can be undertaken with some chance of success;
- to make an estimate of the means to be deployed.

The working party, which includes the most highly qualified geologists from Member States, has met several times at extraction sites in Germany, France and Italy. It will report to the Commission shortly.

To facilitate the working group's task the Commission has communicated to the experts the whole of the Member States' reports on mining exploration, output and investment in their territories transmitted pursuant to Article 70 of the Treaty.

The reports for 1963 indicate known Community reserves at practically the same level as in 1958. But they make it very clear that the endeavours of the several Member States regarding prospection in their territory remain

(¹) See Resolution on the Seventh General Report adopted by the European Parliamentary Assembly on 23 September 1964.

just as uneven as in previous years. In this sphere France is steadfastly pursuing her policy of systematic development of her national resources along with efforts to acquire her own long-range resources in non-member countries, principally Canada, Madagascar and on the continent of Africa.

51. In transmitting these reports to the Council, the Commission reserved its judgment until it should be in possession of the findings of the experts forming the Supply Agency's Consultative Committee.

The Commission and the Agency have also been investigating the natural uranium supply potential of non-member countries. To that end, with the assistance of the Consultative Committee, they have engaged in studies and developed contacts in particular with the United States, South Africa and Canada.

From these contacts it emerges that Canada presents the greatest interest from the standpoint of long-term Community supplies owing to the large resources already discovered and the prospecting possibilities there.

The Commission is canvassing the possibility of exploration in the Argentine, under its cooperation agreement with that country, and remains mindful of the possibilities of cooperation with the associated African Malagasy States.

52. Until about 1980 the enriched uranium requirements of the Community and probably of the western world will be greatly influenced by the choice of reactor strings, that is to say, not only by the advent of advanced converters followed by fast breeders but also by the position of light-water reactors among the proven types.

The Community at present depends for its enriched uranium on the United States, owing to that country's virtual monopoly in the western world. In 1964 the USAEC stated that it had the requisite capacity to meet the civilian needs of the western countries, until around the end of the next decade. At about that time it will probably be necessary to bring in extra isotope separation facilities to cover the western world's requirements.

Recent statements suggest that the USAEC favours expansion of enriched uranium supplies to countries or groups of countries which have signed agreements with the United States for cooperation in the atoms-for-peace area. The terms governing supply will be defined on the American side within the context of the legislation on fissile materials adopted in the summer of 1964. That legislation, which institutes—very gradually—a system of private property in fissile materials, introduces greater flexibility in the conditions

of supply. Non-American users can henceforward choose between the purchase of enriched uranium and toll enrichment of natural uranium (as from 1 January 1965). Insofar as they choose the second alternative, they will have to obtain their natural uranium on the market. This makes it all the more vital for Community industry to have natural uranium resources available.

In any event, the new American legislation in no way detracts from the principle of safeguards employed to ensure that fissile materials are used for peaceful purposes.

Since it is USAEC policy to engage in industrial activities only to the extent that private enterprise cannot undertake them at reasonable prices, the possibility cannot be ruled out that enrichment facilities will be transferred in whole or in part to private industry or that the latter will be granted licences for the operation of new units. In such event a supply policy based on intergovernmental contractual commitments could be supplanted by a system of commercial contracts between enterprises. American industry would then find itself in a dominant position and supply might become subject to conditions not always in accord with the interests of the Community.

Notwithstanding the extent of America's uranium enrichment capacity, therefore, the Commission believes that immediate attention should be given to the question of Community action in the field of isotope separation raised by the European Parliamentary Assembly in its resolution of 23 September 1964. An action of this type launched by the Community would play a big part in reducing its dependence on non-member countries quite considerably. It is generally considered that something on these lines would not be technically or financially beyond the means of Community industry.

53. Plutonium stands out as a key product for nuclear development and will have the added advantage of being produced in the Community.

The potential economies in nuclear fuel and possibly in enrichment capacity which the use of plutonium affords are worth emphasizing. Large-scale employment of plutonium could considerably diminish the Community's reliance on non-member countries, and one effect of this might be to relieve pressure on the balance of payments.

2. Revision of the Treaty provisions on supply

54. Hitherto the Community has coped with the limited tasks involved in the equitable and regular supply of nuclear fuel to users in the Community, pursuant to the existing provisions of Chapter VI of the Treaty. In respect of natural uranium, the simplified procedure introduced pursuant to Article 60

now enables users of natural uranium and thorium to deal directly with producers in a buyers' market. Nevertheless, the Agency retains the power to challenge contracts which do not satisfy the general conditions laid down by it. For fissile material supplies, the machinery prescribed in the Treaty for the conclusion of contracts has given good results as regards the commercial position of users and facilitated the solution of numerous technical and administrative problems raised by the special character of such materials.

However, the provisions of Chapter VI were based on the domestic market set up and on the guarantee of equitable access on a broad scale to the Community's own fuel resources. But many overseas territories which when the Treaty came into force were linked with Member States and some of which certainly possess large uranium resources, have now become independent, thus dimming the prospect for the Community's own resources.

Chapter VI prescribes similar machinery in respect of all materials coming under the Treaty provisions but actual practice has demonstrated the wide variety both in the nature and the processing stage of these materials and how greatly the situation may differ from one to the other. The Commission therefore considered that Chapter VI should not be confirmed in its present wording.

In accordance with Article 76, second paragraph, it therefore initiated the drafting of proposals for amendments which it laid before the Council in November 1964. They were tabled in the European Parliamentary Assembly in January 1965.

The Commission desires to underscore the following features regarding these proposals:

- nuclear fuel supplies are ensured by the pursuance of a joint policy to be periodically defined, both as to ways and means, in the light of information communicated by Member States and enterprises in the Community;
- representatives of producers and users will be closely associated in determining Community action in regard to supply, within an advisory body;
- the rules on the Agency's activity are much relaxed and draw very clear distinction between its two tasks;
- the Agency will be the executive body for the joint policy. As such, the action it takes will be determined by directives issued by the Community institutions within the framework of the Treaty;
- the Agency will be empowered to render all such commercial or administrative services to users as the latter may request;
- there must be no discrimination whatever between users on the part of producers.



**I. Standardizing measuring and application
of safeguards***1. Implementation of Euratom directives*

55. On their publication in 1959, the Basic Standards for the protection of the health of workers and the general public constituted the backbone of a body of legislation which has continued to extend its scope and to become steadily more effective through improved protective systems. In fact, the health and safety of workers and the public at large can today be regarded as effectively safeguarded in the Member States of the Community.

Nevertheless, having regard to the diversity of applications in the atoms-for-peace field and the greater hazards which may arise, the Commission ensured that the Member States persevere in their endeavours to close any gaps or remedy any inadequacies which may be revealed.

Thus during 1964 a number of national laws were added to the body of legislation on the subject.

In Germany, Regulation II on radiological protection (Regulation on protection against hazards from ionizing radiations in training establishments), in respect of which the Commission in 1963 delivered an opinion pursuant to Article 33 of the Treaty, came into force on 30 October 1964. Belgium forwarded to the Commission several drafts dealing in particular with the organization of industrial medicine and the protection of mineworkers. In France the Government is preparing two draft decrees for the detailed application of the Basic Standards; these are expected to be submitted to the Commission shortly. Italy has made considerable advances in the health and safety field with the enactment of legislation to safeguard the general public, mineworkers and workers in nuclear industry and to ensure the safety of nuclear installations. These provisions will be followed by a series of implementing ordinances in respect of which the Commission has already entered into contact with the Italian authorities. Again pursuant to Article 33, the Commission on 21 April 1964 delivered an opinion on a Luxembourg

draft regulation for the protection of the public against ionizing radiation hazards. The text is due to be published shortly and will be followed up by a draft on the protection of workers. No special problems arose in the Netherlands, equipped with legislation in this sphere since the regulations on protection against ionizing radiations were promulgated in March 1963.

2. Revision of the Basic Standards

56. The procedure for the revision of Articles 9 and 10 of the Basic Standards which, initiated in 1960 at the request of the German Government, prompted the Commission to examine the whole problem of exceptional irradiations, is now nearing completion.

After receiving the opinion of the Economic and Social Committee and adopting some of its suggestions, the Commission has just transmitted its final proposals to the Council of Ministers for a decision after consulting the European Parliamentary Assembly.

As far as this particular problem is concerned, therefore, the Basic Standards may be expected to be better suited in 1965 both to recent scientific progress and to the practical needs of workers' health protection.

3. Background radioactivity monitoring

57. To obtain a more thorough understanding of the contamination mechanism, studies on the relationship between climatological factors and radioactive fallout have been undertaken under contract. As a result two very large-scale maps have been drawn of Community countries and surrounding territories, showing mean annual rainfall figures and the average number of days per year when precipitation is 1 mm or more. This is the first time that such exact information can be supplied. At the same time the Commission is pursuing under contract the analytical and comparative study of a prototype portable device for measuring radioactive contamination of foodstuffs in the event of a nuclear accident.

In 1964 the Commission published a summary of radioactivity measurement results in the Community countries. The overall situation is good, since observed levels of radioactivity in the atmosphere and in water represent only a negligible fraction of the maximum figures laid down in the Basic Standards.

The coordination programme on apparatus and methods is proceeding satisfactorily. At the centres set up in Belgium and France, simultaneous measure-

ments have been carried out with the ten types of device most commonly used in Community territory for measuring atmospheric radioactivity. The results will be analyzed statistically and will make comparison of the efficiency of these devices possible.

As regards the monitoring of radioactive contamination of the food chain, particular study has been directed to milk pollution. The Tables attached to this Report give a theoretical assessment of the irradiation dose absorbed by the human body by way of milk intake in 1962 and 1963. Milk accounts for a major proportion of the radionuclides absorbed by the body but other foodstuffs also call for study. Hence the Commission is increasingly concerned with coordinating measurements and observations made in Member Countries and establishing certain criteria for monitoring the radioactive contamination of such foodstuffs.

4. *Radioactive waste*

58. During the period covered by the present report, eight radioactive waste projects were submitted by Member States in accordance with Article 37 of the Treaty. Three were from Belgium and related to Eurochemic, the BR 3 VULCAIN reactor and the Scheldt effluent collector respectively. Projects were communicated by Germany (one) in respect of the Jülich research centre and by France (two) relating to the EDF 1 and EDF 2 reactors at Chinon. Two projects submitted by Italy concerned the Garigliano and Latina power plants. Investigation of these projects, it should be stressed, is a basic feature of the Commission's health and safety policy. Each project is subjected to searching analysis by the relevant Euratom departments before it is passed to a group of experts from the six countries which includes representatives of the entire spectrum of subjects involved in the safety assessment of installations and in evaluating the hazards of environmental contamination. These investigations have on several occasions impelled the Commission to make recommendations for the improvement of safety devices and to spell out the health hazards stemming from radioactive wastes. In this connection, special emphasis should be laid on:

- the need for large-scale meteorological studies to acquire further data on the dilution of radioactive waste gases emanating from a given source and assess their consequences for another Member State;
- the need to draw up, for regions in which several sources of radioactive gaseous effluents are located, a waste gas discharge coordination plan so as to obviate any risk of radioactivity build-up in the atmosphere;
- communication, as required by the Basic Standards, of measures

prescribed by the competent authorities in Member States to safeguard the population in the event of nuclear accidents;

- the establishment and maintenance of liaison between the competent authorities in Member States so that in the event of accidental discharge of radioactive substances from an installation in one Member State the other States may be quickly informed and may be in a position to take all steps to safeguard public health.

5. *Nuclear Plant Safety*

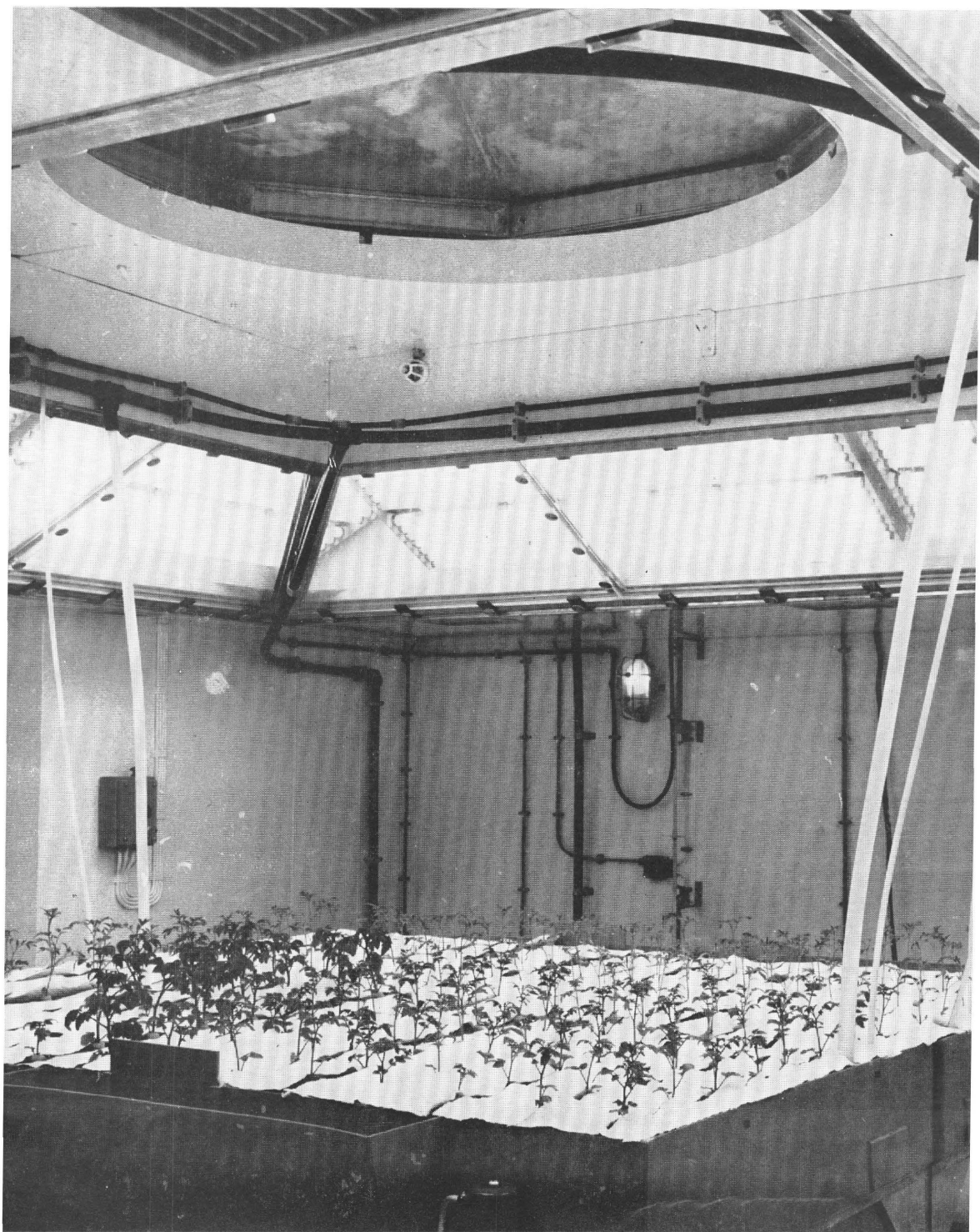
59. In the period under review the Commission, at the request of the Belgian Government, had a study made of the safety report drawn up for the modified BR 3 reactor now called the BR 3 VULCAIN. Parallel with this procedure, another problem raised by the Belgian Government concerns certain safety aspects of the Eurochemic plant. An opinion has been sought in particular on the possible hazards of developing the installation for processing highly enriched fuels as compared with low-enrichment fuel processing envisaged hitherto.

As regards the Ispra Joint Research Centre establishment, a detailed safety report has been made on the ECO critical assembly. The ISPRA 1 reactor and the Decontamination Station at the Ispra Centre are likewise being studied in relation to the radioactive waste discharge programme.

Still on the subject of Ispra, an emergency plan has been prepared for the whole establishment, in close collaboration with the Italian authorities. Identical arrangements have been made at the CNMB, Geel.

6. *Nuclear hygiene and medicine*

60. Less spectacular perhaps than the foregoing but just as vital are the activities undertaken and the results obtained in the field of nuclear hygiene and medicine. Thus the Commission in 1964 initiated a comparative study of dosimetry by film badges, consisting in the irradiation at a specialist institute of 700 separate photographic dosimeters from the principal Community centres. Readings of these films are then made by specialist bodies in the Member States. By comparing the dose readings with the doses actually delivered it has been possible to carry out not only absolute calibrations but also relative calibrations as between the different bodies involved. The results obtained may be regarded as extremely important in that they have enabled modifications and improvements to be made in reading methods, and, in some cases, even in the screens around the films.



ITAL/EURATOM ASSOCIATION FOR THE APPLICATION OF NUCLEAR
TECHNIQUES IN AGRICULTURE: YOUNG TOMATO PLANTS IN AN
ARTIFICIAL CULTURE MEDIUM IN AN IRRADIATION CHAMBER UNDER
THE REACTOR CORE

(See other side of page for caption)

The reactor core is located immediately above the circular aperture visible at the top of the photograph. The novel feature of this reactor is the large irradiation chamber the size of which enables a large number of plants in various stages of growth to be treated simultaneously. Luminosity, air humidity and temperature in the chamber are controlled. The installation is so designed that slow or fast neutrons can be obtained at will.

Furthermore, to acquire further data on the irradiation dose received by certain sectors of the population, the Commission, in conjunction with the national authorities, has perfected a survey method for evaluating radioactive contamination originating from the total diet of young people belonging to the six Community countries.

A survey is likewise in progress with a view to standardizing the processes employed in the Community for the direct determination of the presence of radionuclides in the human body.

This is accompanied by research on a number of problems carried out under contract in collaboration with the relevant Euratom departments; they include decontamination of milk and cereals as well as a survey and analysis of the techniques applied to monitor irradiated items. The file still requires a great deal of additional material before research into the practical application of ionizing radiations for food conservation can be taken further. These studies will help to indicate the lines along which further research should be pursued.

7. Social questions

61. In the matter of social activities, the Commission continued to keep the occupational circles concerned, with particular reference to the labour unions, abreast of developments. A number of lectures were organized for trade unionists in liaison with the Trade Union Joint Information Service. A start was also made on the study of certain special problems connected with the application of the Basic Standards, at a first meeting attended by some twenty ICFTU and ICCTU leaders in March 1965. The discussion brought into relief a number of questions of direct interest to the trade unions today and further meetings are to be held with a view to improving liaison between trade union circles and the Commission in the health and safety area.

II. Research and Studies

1. Radiobiology

62. The general aims of the biology programme as set out in the last Annual Report remain unchanged. The Commission has concentrated mainly on the coordination of efforts deployed within the Community and on bringing them into line with outside projects. This task grows more complex and more difficult every day, and at the same time more useful and indeed vital.

Two means of coordination which call for mention are the meetings of experts held for the precise purpose of carrying out a joint examination of a specific problem, and the organization of lectures and study assignments for young research workers trained in a science other than biology.

63. But the principal instrument of coordination remains the contract programme, constituting as it does the very essence of Community cooperation in this field. This programme, which was successfully continued during 1964, touches *inter alia* on:

- diagnosis and treatment of radiological lesions;
- research into the genetic hazards bound up with radiations;
- exploration of the carcinogenic effects of radiations;
- study of radiation-induced congenital malformations;
- chemical radioprotectors;
- possible consequences of radioactive contamination of our environment;
- application of nuclear techniques to medicine and agriculture.

While to list here the institutions and organizations engaged on this common task would be difficult and to summarize the results achieved would be practically impossible, suffice it to say that these studies have formed the subject of more than 200 published documents and of a large number of scientific reports.

However, among certain results we may list those achieved under the contract of association with the Universities of Brussels and Pisa in the field of nuclear medicine, where extremely accurate analytical techniques combined with thorough-going research into the physico-chemistry and metabolism of certain marked proteins is opening up new possibilities for the diagnosis and treatment of a series of diseases such as cancer, lipid nephrosis, diabetes, arteriosclerosis, etc.

Elsewhere, a clinical study of bone marrow is being carried out systematically under the contract between Euratom and the Gesellschaft für Strahlenforschung, while the toxicity of certain radioelements (more especially plutonium 239 and cerium 144) has been the subject of research performed in conjunction with the French Atomic Energy Commission (CEA) at Fontenay-aux-Roses, while a recent contract with the University of Leyden covers research on the effect of radiations on integrated biochemical systems.

64. The Euratom-ITAL partnership has continued its work on the use of nuclear techniques in agriculture. Studies on the conservation of foodstuffs by irradiation have shown that satisfactory results can be obtained. A method

has been developed by which the movements of strontium in soil can be studied in the laboratory, and work can now start on various types of soil. The first irradiations of vegetable matter have been effected in the reactor, and the dosimetry of these radiations has been studied in detail.

65. Turning to the Ispra biology unit's programme, this in essence dictated by the requirements of the Centre and its staff, and by the need to determine and counteract the effects of any radioactive contaminants present in the Lake Maggiore area. Research therefore continued on the movements of radionuclides in the waters of Lake Maggiore and in the grasslands and rice-fields of the upper plain of the Po. A wide-ranging survey was performed on the source and destination of irrigation waters throughout this area. In addition, a method was devised for detecting exposure to low radiation doses by examining chromosome deterioration in the blood cells. Lastly, studies were completed on the determination and toxicity of the terphenyls used in the ORGEL cooling circuit, the findings being included in the reactor safety report.

2. Rhine Basin radioactivity study

66. This study will be completed in 1965 by the third part of the programme, consisting in river mud radioactivity measurements; this mud collects and retains the radioactive pollution from the water. As the study breaks new ground, a number of fresh technical problems had to be overcome in 1964. Following this work, a manual of procedure was compiled describing in detail the routine to be followed to determine the fixing capacity of muds.

3. Study of levels of radioactive contamination of the food chain

67. With the expanding output of nuclear power, the discharge of waste into the environment will very soon become a problem. Hence it is important to try to discover the levels of radioactive contamination in animals and plants used as human food and also what levels would be tolerable to the individuals or populations exposed. The Euratom/CEA association contract signed in 1961 pertains to joint studies and research to determine those levels. This programme is making satisfactory progress in spite of the complexity of the factors involved in the contamination process, where human biology, nutrition and feeding habits, and the movements of contamination from pollution sources, all play a part. These are scientific studies embracing a wide range of branches of knowledge. Complementary nutrition surveys were carried

out for a year in every Community country, and statistics will be extracted from the findings during 1965. It is worth remarking on the original and uniform nature of these surveys, which had never before been carried out in so detailed and precise a form. The relationships between contamination of the various environmental components and of the foodstuffs are characterized by a great many parameters which modify the migration factors. When the contamination factors have been listed and analyzed and all available data recorded, studies will continue on three main lines :

- migration of radionuclides from cattle fodder into milk and dairy produce;
- direct contamination of vegetable produce;
- direct contamination of cereal crops.

4. *Other research*

68. In October 1964 the Commission published a list of its health and safety research projects, the main subjects being dosimetry, decontamination of air, clothing, water and food, accompanied by statistical studies of the delayed effects of irradiations in man. The numerous proposals received in reply to this announcement are now being considered and will enable a certain number of applied research projects in the field of radiation protection to get under way before the end of the second five-year plan.

I. Establishments of the Joint Nuclear Research Centre

69. The Seventh General Report listed the reasons underlying the creation of a Joint Nuclear Research Centre for the successful implementation of a programme of research to support the national efforts. A detailed account was also given of the way in which the Centre is organized. This year the remarks will be limited to a description of the present status of the work carried out by the four establishments making up the Joint Nuclear Research Centre.

Ispra

70. At the beginning of 1964 the research subjects on which the establishment was engaged broke down as follows:

- A. *ORGEL heavy-water reactor*, including studies on reactor physics, fuels and structural materials, organic coolants, compatibility, fuel pins and elements, the coolant channel, hydrodynamics, heat transfer and the reactor components.
- B. *Establishment activities*, including the draft design of SORA, a pulsed source reactor, and studies on neutron physics, shielding and reactor safety, fuel cycling, nuclear codes, scientific data processing, thermionic conversion with nuclear heating and solid state physics.
- C. *Participation in other Euratom programmes*, i.e., programmes dealing with proven-type and fast reactors, fuel chemistry, effluents and biology.

At the end of 1964, a total of 616 employees were engaged on this research and development work, more than half of them on ORGEL programmes, while 236 others formed the scientific infrastructure, i.e., were responsible for operating the reactor and running the Computer Centre and the electronics, instrumentation, nuclear detection and analytical chemistry sections. The technical departments had a payroll of about 249, while the administrative

and management staff (including the health and safety department, the sick-bay and the library) numbered 311. With the ORGEL team from Brussels, which moved to Ispra around the middle of the year, this makes up a total of 1412 employees.

In the course of the year an attempt was made to improve the coordination of the establishment's own activities (see Para. B above) and those of the ORGEL programme. Mention should be made in this connection of the studies carried out by the Reactor Physics Department on neutron thermalization, shielding and fuel cycling and those undertaken by the Chemistry Department on the radiolysis mechanism of aromatic compounds and the behaviour of fission products and defects in uranium carbide. In an effort to bring about greater uniformity in the work at Ispra, activities connected with documentation and automatic translation were reduced to a minimum in order to enable CETIS to play its full part as the Community's own computer centre. However, certain other establishment activities, notably those relating to experimental neutron physics and direct conversion, were pursued independently and it is the Commission's view that this arrangement should be adhered to in the future also.

With regard to participation in other Euratom programmes (see Para. C above), the Heat Exchange Section and the Chemistry Department pursued their experimental work. Moreover, in collaboration with the head office in Brussels, the establishment continued with the management of contracts as well as carrying out theoretical studies.

In order to avoid a dispersion of effort over a range of fields bearing no relation to the fundamental aims, every effort was made to lessen the distinction between the ORGEL activities proper and the other work in both applied and basic research. In addition to this need for rationalization it should be borne in mind that the funds available to the Community are limited, but nonetheless every attempt will be made to go ahead with the studies already in progress.

With regard to large-scale scientific equipment, it should be mentioned that numerous experimental devices have been installed around the ISPRA-1 reactor and in its channels. This reactor, which ran non-stop throughout 1964, is intended to be used at maximum capacity for experimental purposes in 1965.

During the first two months of 1964 work was completed on the assembly of the EXPO exponential experiment, which marks a very important stage in the ORGEL programme, and a certain number of measurements were carried out (on UC/organic/heavy-water lattices). The Van de Graaff accelerator for experimental neutron physics went into service, while work was started on the assembly of the accelerator for organic chemistry. The medium-

activity laboratory installations are almost finished and from the beginning of 1965 examination of irradiated fuel pins can be commenced. The CETIS digital computers were staffed by 2.5, and towards the end of the year by three teams, so that round-the-clock utilization was possible.

On the whole the research appropriations for 1964, including the ORGEL appropriations and other amounts authorized for specific projects to be carried out in part by the establishment, proved sufficient to keep research activities up to the required level. The same cannot be said of the appropriations for infrastructure; when the 1964 budget was voted, certain operations, connected with site improvements and buildings, had been postponed to 1965. But under the budget it adopted for this financial year the Council made no provision for the requisite appropriations; these will be the subject of a request for readjustment under the 1965 supplementary budget. Furthermore, it proved impossible to carry out certain alterations, in spite of the fact that they were intended to improve working conditions and reduce future maintenance expenses.

Geel — CNMB

71. Work on the installing of the linear accelerator LINAC, following the bringing into service of the Van de Graaff accelerator in the previous year, has progressed so far that the CNMB will shortly be able to respond more fully to the ever-growing demands for neutron data. A direct telephone hook-up linking the CNMB to the electronic computer installations of the Information and Documentation Centre in Brussels and the CETIS at Ispra will make for more rational use of the data supplied and thus for more effective processing of the nuclear data assembled by the establishment, more especially through its collaboration with the European-American Nuclear Data Committee.

The CNMB continued working with standards bureaux both inside and outside the Community; the expanded Euratom Nuclear Data Committee, composed of Community reactor and nuclear measurements experts, continued to coordinate measurement programmes in Member Countries and prepare the ground for the work of the European-American Nuclear Data and Reactor Physics Committees.

The CNMB also takes part in the work carried out by the consultative Committee on Ionizing Radiations of the International Bureau of Weights and Measures. Furthermore, Euratom was represented by observers at the meetings of a working party of the International Atomic Energy Agency, Vienne, which deals with nuclear data on a worldwide scale.

Karlsruhe — European Transuranium Institute

72. In 1964 a big step was made towards giving shape and life to the European Transuranium Institute. While the civil engineering work went forward according to plan, it was also found possible to build the premises to house the general and administrative departments, basic research and technology and the chemistry laboratories and hot cells.

In each instance the scientific equipment is installed and tested without delay. Thus a 3 MeV Van de Graaff accelerator has already been assembled and the technology department, where the fuel load for the MASURCA critical experiment is being fabricated, has been completely fitted out.

With the high-activity hot laboratory and the chemical and ceramic technology laboratory completed, it will be possible to proceed with the post-irradiation inspection of plutonium-based fuel-elements and with burnup measurements, as well as with tests on plutonium elements on a wider scale than is feasible with the equipment available in the basic research laboratory.

The Transuranium Institute's programme of work will include studies of ceramic materials, the technology of plutonium-based ceramic materials and of plutonium metal and its alloys together with research on the cladding materials most suitable for this type of fuel. Irradiations and post-irradiation physical and chemical examinations of these fuel elements for thermal and fast reactors also figure on the programme.

Lastly, it should be noted that the scientific and technical staff who had in previous years been assigned temporarily to specialized research centres in various Community countries and the United States resumed their normal duties at the establishment in 1964.

Petten

73. Petten, the most recent of the Euratom Joint Research Centre's establishments, has hitherto concentrated chiefly on operating the HFR materials-testing reactor.

At the present time, the prefabricated buildings and the dismantling cells are finished. Construction of the technology hall is nearing completion, while the plans and preliminary designs for the medium-activity and cold laboratories are ready.



ISPRA — THE WORKSHOP

One of the establishment's first tasks is to step up the HFR reactor's power gradually from 20 MW to 50 MW. The higher power will give the reactor a greater irradiation capacity.

The programme laid down provides for further research on the EXOR capsule and its adaptation to the requirements of the ORGEL project. With this device fuel-element pins can be irradiated in the reactor pool under precisely controlled temperature and power conditions.

In conclusion, the establishment has embarked on a programme to develop fuel elements for high temperature gas reactors in close collaboration with the THTR association and the Dragon project.

II. Contracts

74. In addition to the work done by the JRC itself, a considerable part of the research activities—involving substantial appropriations and important programmes—is farmed out under contract, the Commission entrusting certain research to Community bodies or laboratories, or carrying out certain major projects in association with them.

Concerned to select its partners with care and at the same time promote well-balanced development on the Community level, the Commission has for over two years given the widest possible publicity to such schemes as it intends to handle under contracts.

The first list (published in the Journal Officiel of 1 December 1962) which embraced most of the activities covered by the second five-year programme, was followed by a second concerning the processing and storage of active wastes (28 July 1963) and a third on health and safety and technical and economic studies (7 October 1964).

During the reference period these announcements brought in nearly 750 tenders, mainly in the form of complete detailed proposals, the breakdown being as follows:

a. *by field of activity*

- 41.5% of the proposals concern reactor development (including: ORGEL project 15% of total; proven-type light-water reactors 16%; gas/graphite 8%);
- 13.5% pertain to biology and health and safety projects;
- 45% relate to other activities (including: research on radioisotopes and their industrial uses 16%; technical and economic studies 8%; active waste processing 6%; direct conversion 4.6% etc.).

b. *by country of origin*

- 9.6% Belgium
- 28.9% France
- 23.6% Germany
- 23.6% Italy
- 0.4% Luxembourg
- 7.0% Netherlands
- 6.9% Non-member countries.

5% of these proposals were submitted jointly by at least two organizations or firms in different Member States.

c. More than half of all proposals were submitted by industry.

d. The Commission has so far decided to open negotiations on 33% of the submissions.

The Commission awards two kinds of research contract—the research contract proper, and the contract of association by means of which the Commission links up with some other organization, generally a public body, to initiate or forward large-scale research programmes dealing with subjects (such as controlled thermonuclear fusion, fast neutron reactors, aqueous suspension reactors, marine propulsion, biology etc.). The implementation of such contracts is supervised by a Management Committee comprising representatives of the interested parties and responsible, in particular, for mapping out the lines on which the research is to be carried out, planning it in detail, and administering the finances.

Thus the Commission continued to apply this contract system in 1964, in order to pursue the research programme launched in the previous years.

In the year under review the Commission concluded one hundred and forty research contracts and seven contracts of association (including four supplements to existing contracts).

Other research contracts signed dealt mainly with proven-type reactors, radioisotopes and the ORGEL project. Most of the contracts relating to proven-type reactors were for the continuation of earlier contractual research (studies on heavy-gauge steels, heat transfer, fuel elements, cladding materials, etc.).

The radioisotope contracts are aimed at developing techniques for the synthesis and storage of labelled molecules and promoting the use of radioisotopes in various branches of industry.

As to the ORGEL project, research contracts centre chiefly on sintered aluminium powder (SAP) and organic liquids.

In addition, Euratom has continued to award a certain number of contracts as required for the operation and development of its Joint Research Centre establishments and other projects, and in particular for constructing the ESSOR complex, continuing the Ispra and Petten building programmes, and acquiring scientific equipment. Authorized expenditure under this head amounted to roughly 15 million EMA u.a. in 1964.

III. Dissemination of Information

75. The Information and Documentation Centre (CID) is the body appointed by the Commission to disseminate scientific and technical information.

Its task is, firstly, to keep the Community informed of the results of research under the programme, and secondly, to afford Community research organizations and industry access to scientific and technical information published anywhere in the world.

The CID discharges the first of these functions by circulating to Member States and to persons and enterprises in the Community knowledge stemming from the research programme and likely to be of use in industry, and also by publishing the Euratom Reports. Apart from this it puts out two periodicals—"Euratom Information", which contains abstracts of published research results, the broad outlines of the programme and the subject of contracts signed and patents granted, and the "Euratom Bulletin" which, catering for a wide public, acts as a sounding-board for discussion of questions relating to the peaceful uses of nuclear energy.

In its second role the CID endeavours to fill the gaps in the international nuclear documentation system; to this end it publishes the monthly "Transatom Bulletin", which gives information on nuclear documents translated from Slavonic or oriental languages, and shares, by contract, in the publication of "Nuclear Medicine", a bibliographical journal published by the *Excerpta Medica* Foundation, and "La Propriété Industrielle nucléaire" (Nuclear Industrial Property), a review dealing with nuclear patents.

The CID's most important work is the elaboration of an automatic reference system by which, as early as 1965, an electronic computer for the rapid output of comprehensive bibliographical selections from the 300,000-odd nuclear data units now being analyzed and stored in its memory. This automatic documentation system, in which various countries, including the United States, have offered to collaborate, will be available to Community research and industry by the end of 1965.

IV. Training and Instruction

76. The rapid and coherent expansion of the nuclear industry throughout the six Community countries depends on the number of experts and research workers available. It is therefore essential to train specialized scientists and to see that those who have qualified in a special branch can round off their general knowledge either by post-graduate courses or by periods of training in industry or in a nuclear research centre.

1. *On-the-job training*

77. The measures adopted by the Commission over a number of years to enable research scientists to extend their education in the nuclear field and form contacts with specialists in other branches of science, were continued along the same lines in 1964.

Courses were arranged in the nuclear research centres, and particularly in the JRC establishments and nuclear power plants, for students nearing the end of their studies. The Commission accepted 156 candidates for these courses in 1964, of whom 64 started in the course of the year, the others being due to begin in 1965.

Furthermore, the Commission accepted for courses in JRC establishments 24 qualified research scientists (17 of them from non-member countries) from other research centres or industrial enterprises interested in Euratom's scientific and technical activities.

2. *Grants*

In 1964 the Commission introduced the new grants system announced in the Journal Officiel of 21 January 1964, which aims at supporting the training courses by providing further education in nuclear science for university graduates.

There are three types of grant:

- a. thesis grants
- b. specialization grants
- c. grants for young university lecturers to study at nuclear research centres.

Thesis grants apply to the experimental or theoretical preparation of a doctor's thesis to be presented at a science faculty or a teaching establishment of equivalent standard.

The specialization grants are designed for graduates studying for a further specialized degree or diploma or a specialized scientific publication.

Lastly, the third type of grant is to enable young university teachers to take part in scientific research work and keep abreast of the latest developments in their subject.

In 1964, 63 applicants out of 178 succeeded in obtaining a Euratom grant.

Whereas student trainees share normally in the day-to-day work of the permanent teams at the research centre or carry out studies on minor problems, the grant-holders work more or less independently on specific subjects within the context of the host centre's research programme.

The Commission believes that this grants' system is an effective method of helping to train the nuclear experts needed by the Community in ever-increasing numbers.

3. Instruction

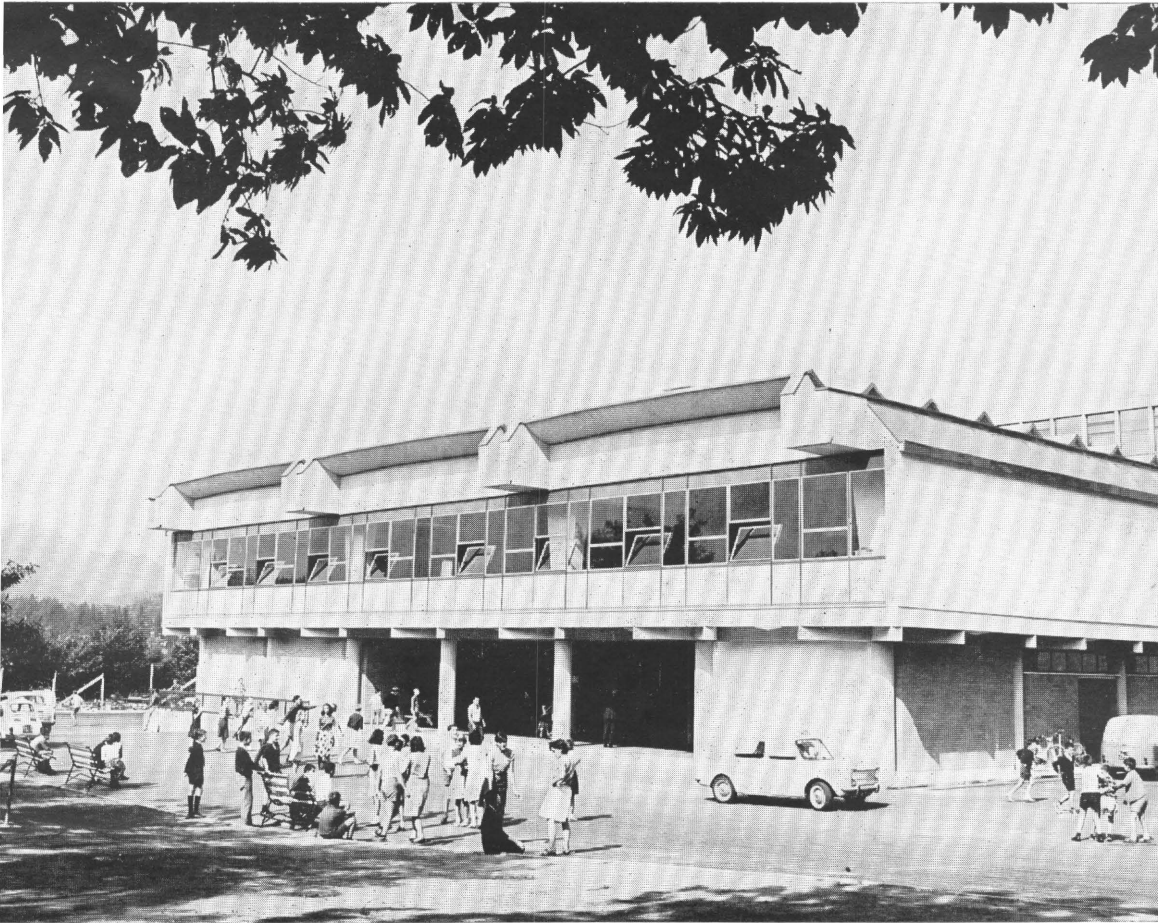
79. The Commission has continued its endeavours to coordinate the Training received in nuclear science by technicians in Community countries.

With the aid of national experts a programme for training nuclear instrumentation and control technicians has been added to the published curricula for radiation hygiene, radiochemistry and isotope applications.

As to technical training, the national experts have devised a programme for training reactor operators.

The Commission proposes to form a Central Board for the coordination of nuclear training which, working closely with the national authorities, will ensure that the instruction programmes are properly followed and kept up to date, and will have the right to endorse diplomas awarded on the strength of the Euratom programmes.

The purpose of this measure is to afford holders of diplomas easier access to nuclear jobs and to facilitate the exchange of technicians within the Community.



VARESE — ENTRANCE OF THE EUROPEAN SCHOOL

80. The steady expansion of Euratom's external relations continued whenever fresh possibilities of useful international cooperation arose. Specifically, the question of cooperation in respect of fast reactors, foreshadowed in 1963, is now settled policy and in process of implementation. Also noteworthy in this connection were the closer working links with the Swedish authorities and the further increase in the number of non-member countries with diplomatic missions accredited to the Community.

I. Relations with non-member States

1. Countries with which Euratom has concluded cooperation agreements

81. It will be remembered that in 1963 Euratom signed an Amendment to the Supplementary Agreement of 1960 with the United States, the main object being to enable the United States Atomic Energy Commission to make larger quantities of special fissile materials available to the Community. The Amendment was approved by the United States Congress on 1 August 1964. The 1960 Supplementary Agreement as now amended provides for the supply of uranium 235, plutonium and uranium 233 to the Community, subject to the necessary authorization, with no specified limits ⁽¹⁾. Simultaneously, with its approval of the 1963 amendment to the 1960 Supplementary Agreement, the United States Congress in August 1964 authorized the transfer of 70 tons of enriched uranium and 500 kg of plutonium to the Community. The Commission was informed by the USAEC that a greater quantity of this fuel might be available.

Cooperation between the two parties in the fast reactor field, already under study for some time, quickly took formal shape.

The Agreement signed on 25 May 1964 between the Euratom Commission

(¹) Ceilings fixed in the text of the 1960 Supplementary Agreement were 30 tons of U 235 up till 1963 and 9 kg of plutonium up till 1962.

and the USAEC covering a vast programme of cooperation on fast reactors constitutes a milestone in the relationship between the Community and the United States, extending it to take in one of the most promising sectors of nuclear energy development.

The Agreement, concluded for a term of ten years, covers exchange of information and personnel relating to all work connected with fast reactors undertaken for peaceful purposes on either side. This means that the scope is very wide indeed since, on the European side, it was signed by the Euratom Commission on behalf of the Community as well as by its associates in this domain—the French CEA, the Gesellschaft für Kernforschung and the CNEN. Thus the Agreement covers the bulk of the efforts directed by the Six towards fast reactor development.

The magnitude of the cooperation thus pledged may be gauged from the finances to be committed: provision is for about 200 million dollars up to 1967 on the European side and nearly as much on the part of the USAEC.

82. The picture of international cooperation pledged by Euratom in respect of fast reactors would be incomplete without reference to the implementation of the cooperation agreement with the United Kingdom. As regards procurement, for instance, a second contract was signed with the UKAEA for the supply during 1965 of additional amounts of plutonium for the RAPSODIE fast reactor, administered under a contract of association between Euratom and the CEA. The entire initial fuel charge for this reactor (90 kg of plutonium oxide) will therefore have been furnished by the UKAEA. Again in the fast reactor field, technical consultations have taken place with British experts to determine the form and extent of potential cooperation between the two parties. These consultations have yet to be brought to a conclusion, but the Continuing Committee for Euratom/United Kingdom Cooperation, meeting in London in June 1964, likewise looked into the possibility of joint research on fast reactors.

It noted with satisfaction the fruitful exchanges which had recently taken place in connection with basic research as well as in the industrial and economic spheres. In accordance with the Committee's decision of 1963 to strengthen cooperation between the parties in various areas of research, their experts have had many opportunities during the past year for the joint consideration of an increasing variety of subjects: operation and utilization of research and test reactors, heat exchange, solid state physics, basic physics of metals of nuclear value, biology, radioisotopes.

83. Implementation of the Technical Agreement between Euratom and Atomic Energy of Canada Limited (AECL) progressed satisfactorily during

the year. The Agreement, which was concluded in 1959 for a period of 5 years, expired in October 1964. This cooperation consisted essentially of exchanges of information, as a result of which effective coordination of the research programmes of the two parties on heavy-water-moderated reactors was instituted, thus helping to speed up progress in the work of both sides.

The Technical Agreement was, of course, concluded within the context of the General Agreement between the Community and the Canadian Government, signed also in 1959 but for a ten-year term. Negotiations are in hand for renewing the technical agreement, in all likelihood for a second term of five years.

84. While the position remained static last year as regards implementation of the Cooperation Agreement between Euratom and Brazil, the series of conversations of the procedure for giving effect to the Euratom/Argentine Agreement continued.

The latest of these talks between the Commission and the Argentine National Atomic Energy Commission were held in the autumn of 1964, and it is hoped it will soon be possible to arrive at concrete achievements in so far as the Euratom Commission's resources permit.

2. Other countries

85. Lessons drawn from long-standing contacts with Japan, together with searching study of official proposals for cooperation received from the Japanese authorities, constitute weighty arguments, in favour of developing relations between Euratom and Japan.

In the Commission's view, effective cooperation can be established in the form of arrangements for exchange of information and of technicians in three fields, namely, research (including fundamental research and reactor physics), marine propulsion, and health and safety and biology. Accordingly the Commission has just brought the matter before the Council for discussion.

At the same time Euratom's relations with Sweden, developed over the years through mutual visits at official level and numerous technical contacts, were placed on a rather more formal basis in 1964 though they are still basically pragmatic in character. In agreement with the Swedish authorities, certain spheres of activity of common interest were defined, in which technical relations are to be set up between the Euratom Commission and the AB Atomenergi. Experts have been appointed for the purpose by both sides.

Having regard to the place occupied by heavy-water reactors in the research programmes of the Community and of AB Atomenergi, it is mainly on reactor

physics in this sector that the stress is laid; but the cooperation established in this way will also extend to nuclear data, fast reactor physics and reactor technology (burn-out and hydrodynamics).

Mention must also be made of the good working relations maintained by the competent Euratom departments with the Afro-Malagasy Union for Economic Cooperation (UAMCE, formerly OAMCE, dissolved February 1965 and succeeded by OCAM, the Organisation Commune Africaine et Malagache), through which Euratom has been enabled to keep in touch with the States of Africa and Madagascar. In addition, the Commission was represented at the First Annual Meeting of the Parliamentary Conference of the Association between the EEC and the Associated African and Malagasy States (Dakar, 8-10 December 1964).

3. Missions accredited to Euratom

86. Finland and Pakistan have now accredited missions to the Community. This brings the number of non-member countries maintaining diplomatic relations with Euratom to twenty-four. Several others have initiated procedure for accrediting a diplomatic mission to the Community.

II. Relations with international organizations

87. Euratom continued its regular participation in the work of the Organization for Economic Cooperation and Development (OECD) and, more especially, of the European Nuclear Energy Agency (ENEA). Radiological protection, scientific problems and questions of energy production constituted the main spheres of cooperation with OECD. Under this head, the Euratom Commission was represented at the second Parliamentary Scientific Conference held at Vienna in May 1964 by OECD and the Council of Europe.

The outstanding event of the year, however, was in the field of Euratom/ENEA cooperation. The DRAGON reactor, in the construction of which Euratom had been participating since 1959, went critical on 23 August 1964 and was officially inaugurated on 22 October.

Meanwhile, by the terms of an agreement signed on 17 June 1964 between Euratom and OECD, it was decided that ENEA would set up its computer programmes library in the CETIS buildings at Ispra. In this way the library, on the premises of the Joint Research Centre establishment, will be able to draw on the general services and, above all, the computation facilities already installed there.

The main function of the ENEA library will be the assembling, compilation and distribution of the nuclear computer programmes of European and American laboratories. It will work in close liaison with similar libraries in the United States and will be open to the appropriate services both of the Commission and of ENEA countries.

A further point of note is that, notwithstanding the expiry of the Halden Agreement on 30 June 1964, this reactor will continue to operate on an international basis by virtue of a fresh agreement signed by several Euratom Member States.

88. The Commission was represented as in previous years, at the invitation of the Board of Governors, by an observer at the General Conference of the International Atomic Energy Agency (IAEA) (Eighth Ordinary Session, Vienna, 14-19 September 1964).

Furthermore, working relations between the competent departments of the Commission and of the Agency Secretariat remained as active and varied as formerly.

89. Lastly, the cooperation established with the International Labour Organization (ILO), the United Nations Food and Agriculture Organization (FAO) and, more recently, the Inter-American Nuclear Energy Commission (IANEC) has enabled Euratom representatives to keep in touch with the work of those bodies and to maintain useful contacts with them; thus an observer from the Commission attended the Fifth Meeting of IANEC (Valparaiso, 3-6 March 1964).

The same applies to the long-standing relationship between the Euratom Commission and the Council of Europe.

III. Other Activities in the Field of External Relations and Coordination of Such Activities

90. While, as mentioned above, methods of implementing Articles 103 and 104 of the Treaty have been under discussion between the Council and the Commission, the latter was notified during the past year of draft agreements as follows;

- Italian Atomic Energy Commission (CNEN / Pakistan Atomic Energy Commission,

- CNEN / Argentine National Atomic Energy Commission,
- CNEN / USSR State Committee for Atomic Energy,
- CNEN / South African Atomic Energy Commission,
- CNEN / Atomic Energy of Canada Limited,
- Belgian Atomic Energy Commission / Indian Atomic Energy Commission,
- French Atomic Energy Commission / Indonesian Atomic Institute,
- Belgian CEN and Reactor Centrum Nederland / GLAVATOM (USSR).

91. Such comments as the Commission felt called upon to make concerned the implementation rather than the letter of these agreements. As in previous years, the Commission stressed the importance which it attaches to receiving the technical and scientific information exchanged by the parties, in order that the Community as a whole may benefit. It was given the desired assurances on this point. Another consideration voiced by the Commission relates to the possible conclusion by the Community of a general cooperation agreement with one of the non-member countries concerned. In such an eventuality, the Commission takes the view that bilateral agreements already concluded by the Member States with that country ought then to be implemented under the Community agreement.

The Commission maintains its attitude as expressed last year, however, on the subject of agreements entered into with Governments or government bodies in non-member countries; such agreements, especially those of a general nature, ought no longer to be concluded by one or more Member States but by the Community. The growing interlinking of Euratom's internal activities with those of the Six increasingly calls for progressive alignment of their relations with non-member countries. This, as the Commission sees it, implies that wherever those relations affect Community interests they should to an ever increasing extent be established and sustained by the Community acting on its own behalf and on behalf of its Members.

In this context, and from a more general angle, the exchange of views previously initiated between the Council and the Commission on the Community's external relations proceeded satisfactorily.

It would of course be premature to attempt to draw anything like final conclusions from this debate between Council and Commission.

Nevertheless the Commission has been happy to note the desire of the other parties to the discussion to reach concrete and Community-wide solutions.

THE INSTITUTIONS OF THE COMMUNITY AND INTER-EXECUTIVE COOPERATION

I. The European Parliament

During the period under review, the European Parliament held seven plenary sessions, as well as a joint session with the Consultative Assembly of the Council of Europe.

92. At its constituent session in March 1964, the Parliament elected M. Duvieusart as President. The predominant features of this session were a debate on institutional questions, during which Mr. Fayat, the President in office of the Councils, made a statement which attracted much attention, and a debate on the prospects for nuclear energy in the Community. At the close of the latter discussion the Parliament adopted a resolution calling upon Euratom to continue its policy of participation in power plants, to foster the development of European industries of European-inspired techniques for the construction of these plants, to provide support for their operation and thus to create within the Community a climate conducive to a more rapid mobilization of the construction industries.

93. At the May session, the Parliament voted a resolution calling for a strengthening of its budgetary powers, and another on the setting-up of a European university, in which it broadly approved the Italian Government's proposals, subject however to certain amendments which it deemed essential.

During the same session a debate also took place on energy policy; this closed with the passing of a resolution in which Parliament, while noting with satisfaction that a protocol had been adopted, expressed certain reservations.

94. At its June session, the Parliament heard a statement by Euratom President Chatenet presenting the Commission's Seventh General Report.

95. In June the Parliament also held the traditional joint meeting with the Consultative Assembly of the Council of Europe. For the first time, the discussion was not limited to work of the European Parliament and the three Executives during the past year, but centred on a specific topic,

namely, "Commercial relations between the Community and the rest of the world".

On this occasion the Commission raised the question of policy with regard to cooperation with the great nuclear powers, Community customs policy and Euratom's obligations in the shaping of a common supply policy.

96. The September session was marked by the discussion of Euratom's Seventh General Report, introduced by Mr. Pedini's report. The Parliament wound up this debate by adopting a resolution which, after recalling the part which Euratom could and must play in fostering the development of nuclear techniques in all fields, particularly in that of energy, approved the policy set out in the Seventh General Report.

During the September session, Parliament also adopted resolutions concerning the following:

- energy policy considered from the standpoint of the coming merger of the European executives;
- the budgetary and administrative questions raised by the merging of the Executives and possibly of the Communities.

97. The highlight of the October session was a big debate on the work of the EEC. This session was also marked by a wide-ranging exchange of views with the EEC Commission on the subject of Mrs. Strobel's oral question concerning the democratization of the European Community. Furthermore, in October the Parliament adopted the following resolutions:

- a resolution approving proposals submitted to the Councils by the EEC and the EAEC Commissions concerning the reform of the salary scale and the system of allowances and subsistence grants for Community staff, and adding recommendations on various points;
- a resolution recording the Parliament's view on the proposals submitted to the Councils by the EEC and the EAEC Commissions concerning a regulation governing the procedure for applying to the staff of the Committee of Control the statute of service and the conditions of employment applicable to other employees, in which it approved these proposals;
- a resolution on the management accounts and financial balancesheets relating to the budget operations of the financial year 1962 of the EEC and EAEC and on the Committee of Control's report on the accounts for the financial year 1962;

- a resolution signifying its approval of the EAEC Commission's proposals to the Council on the procedure for recruiting staff for scientific and technical work at the Joint Nuclear Research Centre.

98. The November session was marked by the customary annual Conference with the Councils of Ministers. In 1964 its theme was "The Community and the economic outlook". The Commission took an active part in the debate.

During the November session, the Parliament also adopted a resolution relating to certain aspects of the research and investment budget and the Euratom draft operating budget for the financial year 1965. It particularly regretted that the 1965 research and investment budget would not be finally adopted by 31 December 1964 at the latest and urged the Councils and the Executive to draw up a draft research budget as soon as possible and to make a speedy start on the adjustment of the second five-year programme.

II. The Council of Ministers

73rd Session (3, 4 and 5 February 1964)

99. The Council, meeting under the presidency of Mr. Fayat, took note at this joint meeting that because of a continuing divergence of views with regard to the staffing of the Assembly and the Court of Justice, the operating budget could not be finally adopted at that moment.

The Council also appointed a new member of the Scientific and Technical Committee in the person of Mr. Mandel, to succeed Mr. Reuter, who had resigned.

74th Session (24-25 February 1964)

100. The Council, meeting under the presidency of Mr. Fayat, adopted certain measures designed to permit the operating budget for 1964 to be put into effect.

77th Session (13, 14 and 15 April 1964)

101. The Council, meeting under the presidency of Mr. Fayat, appointed Mr. Castelli as the successor of Mr. Angelini as member of the Consultative Committee of the Supply Agency.

It then expressed its agreement on the establishment of a procedure for the exchange of information in the fast reactor field between the Euratom Commission and the American Atomic Energy Commission.

78th Session (8 May 1964)

102. The Council, meeting under the presidency of Mr. Fayat, appointed two new members of the Scientific and Technical Committee, Mr. Born and Mr. Dondelinger, who succeeded Mr. Gentner and Mr. Stumper.

80th Session (1 and 2 June 1964)

103. The Council, meeting under the presidency of M. Fayat, approved a draft agreement between Euratom and the European Nuclear Energy Agency concerning the setting-up of a computer programme library at Ispra.

81st Session (16 June 1964)

104. At this session the Council, meeting under the presidency of Mr. Heger, expressed its agreement on a draft decision approving an amendment to the articles of the Joint Enterprise "Kernkraftwerk Rheinisch-Westfälisches Elektrizitätswerk-Bayernwerk GmbH (KRB)".

82nd Session (25 June 1964)

105. The Council, meeting under the presidency of Mr. Fayat, had an initial exchange of views on the Commission's proposals of 28 May 1964 concerning the revision of the second five-year programme and on the general trend to be pursued by Euratom in its technical research and industrial promotion policies.

At the close of this exchange of views the Council agreed to instruct the Committee of Permanent Representatives to follow up these questions and to table them for further discussion at a session fixed for 23 July 1964.

84th Session (22 July 1964)

106. The Council, meeting under the presidency of Mr. Lenz, continued its examination of the Commission's proposals concerning the adjustment of the second programme in the light of the discussion of 25 June 1964.

The Council also took note that the Community will itself provide provisional

cover for the "third party" risk for the whole of the Karlsruhe establishment of the Joint Nuclear Research Centre up to the end of July 1965.

87th Session (6 October 1964)

107. The Council, meeting under the presidency of Mr. Cartellieri, continued its discussion on the adjustment of the second five-year programme.

88th Session (12-13 October 1964)

108. The Council, meeting under the presidency of Mr. Neef, adopted the Community's operating budget and forwarded it to the Parliament for its opinion.

89th Session (30 October 1964)

109. The Council, meeting under the presidency of Mr. Cartellieri, continued its exchange of views on the adjustment of the second five-year programme.

91st Session (27 November 1964)

110. The Council, meeting under the presidency of Mr. Lenz, held a short discussion on the adjustment of the second five-year programme and then began drafting the research and investment budget for the financial year 1965.

At this session the Council also instructed the departments concerned to prepare the ground for an initial exchange of views by the Council on the substance of the Commission's proposals aimed at modifying the supply provisions of the Treaty.

92nd Session (30 November and 1 December 1964)

111. The Council, meeting under the presidency of Mr. Schmücker, deferred the total suspension of the common customs duty on deuterium and its compounds until 31 December 1968.

93rd Session (12, 18 and 19 December 1964)

112. The Council, meeting under the presidency of Mr. Schmücker, granted to the "Kernkraftwerk Lingen GmbH" the status of Joint Enterprise for a period of 25 years with effect from 20 November 1964.

In return for the advantages granted to this firm, the Community will have access to all the technical and economic industrial information obtained during the construction and operation of this nuclear plant.

In addition, the Council has provisionally extended for one year the insurance contracts covering the Community's third-party liability for the Joint Centre establishments.

The Council finally adopted the operating budget for 1965.

The Council undertook to adjust the second five-year programme before 1 April 1965.

Lastly, the Council adopted by a qualified majority vote the draft Community research and investment budget for 1965.

In order that the credits earmarked under the draft budget should not prove an obstacle to the adjustment of the second five-year programme, the Council provisionally restricted the appropriations under this budget to the sums strictly necessary for the continuance of those projects in hand under the second programme and for the normal development of the Joint Centre establishments.

Furthermore, it arranged that as soon as agreement is reached on the programme adjustment, the Commission will submit to the Council a preliminary draft supplementary budget designed to adapt the appropriations under the budget adopted on the basis of the amendments made to the programme.

Other Activities of the Council

113. At its 73rd Session (3, 4 and 5 February 1964), the Council and the Committee of Presidents of the ECSC exchanged views in connection with the annual review of officials' salaries.

The Council thereafter instructed the Permanent Representatives to make on the question of salaries a further study covering the widest possible range of factors, to be taken into account for the purposes of implementing Article 65 of the Statute.

The Council also appointed two new members to the Economic and Social Committee—these were Mr. van de Westijne, succeeding Mr. Adriessen, and Mr. Van Greunsven, replacing Mr. Bogaerts.

At its 74th Session (24-25 February 1964), the Council discussed questions relating to the merging of the Institutions and the strengthening of the powers of the European Parliament.

In addition, the Council appointed Mr. Haferkamp as a member of the Economic and Social Committee in succession to Mr. Rosenberg.

At its 76th Session (25 March 1964), the Council held a fresh debate on questions relating to the merging of the Institutions and the strengthening of the powers of the European Parliament.

At its 77th Session (14-15 April 1964), the Council completed its annual review of the official's salary scales.

It decided to fix, with effect from 1 January 1964, new adjusting factors for most of the countries or localities where Community officials are established, on the basis of Article 65 of the Statute, Sections 1 and 2. It also decided to consider a revision of the salary scale as soon as the Commissions should put forward proposals to this end.

At its 78th Session (8 May 1964) the Council discussed the question of the merging of the Institutions.

At its 80th Session (1 and 2 June 1964), the Council received Mr. Roche, whose term of office as President of the Economic and Social Committee was about to expire.

At its 81st Session (16 June 1964), the Council once again debated the merger of the Institutions and the reinforcement of the powers of the European Parliament.

On this occasion it studied a preliminary draft Treaty.

At its 83rd Session (7 July 1964), the Council again discussed the merging of the Institutions and the strengthening of the powers of the European Parliament.

It also appointed a new member of the Economic and Social Committee—Mr. Ameye, to succeed Mr. Masoin, deceased.

Lastly, the Council took note of the proposals made by the Brussels Commissions and the High Authority of the ECSC concerning the revision of the salaries and of the system of allowances and subsistence grants paid to Community personnel, as well as the special conditions applying to officials

of the scientific and technical branches of the Euratom Joint Nuclear Research Centre. The Council agreed to refer these proposals to the Parliament and the Court of Justice for an opinion.

At its 86th Session (18 September 1964), the Council again studied the merging of the Institutions and the strengthening of the powers of the European Parliament.

In addition it appointed a new member of the Economic and Social Committee, Mr. Schrijvers, to succeed Mr. Van Spaendonck.

At its 88th Session (12-13 October 1964), the Council continued its exchange of views on the merging of the Institutions and the strengthening of the powers of the European Parliament.

It also held a thorough discussion on the course of the GATT multilateral trade negotiations. Following this discussion the Council took all the necessary technical steps to ensure that the Community list of exceptions would be ready in time for submission to GATT on 16 November 1964 as agreed by the contracting parties.

Lastly the Council appointed a new member of the Economic and Social Committee, Mr. Hildgen, to succeed Mr. Bousser.

At its 90th Session (10, 11 and 12 November 1964), the Council continued its debate on the merging of the Institutions and the strengthening of the powers of the European Parliament.

It then appointed two new members of the Economic and Social Committee, Mr. Jansen, to succeed Mr. Verrijn Stuart, and Mr. Albeda, to succeed Mr. van der Mei.

In addition, the Council decided to unify the statutes of the officials of the ECSC and the two Brussels Communities as regards pensions.

Lastly, the Council approved the list of exceptions to be submitted by the Community to GATT on 16 November 1964.

At its 92nd Session (30 November and 1 December 1964), the Council again debated the merging of the Institutions and the strengthening of the powers of the European Parliament.

On this last question, it took note of a statement by Mr. Luns. It was decided to consider this statement in conjunction with the proposals submitted in February 1964 and November 1964 by the Italian and German Governments respectively.

III. The Court of Justice of the European Communities

114. The work of the Court does not call for special comment as regards Euratom.

In addition to certain actions brought against the Commission by officials, the Court pronounced judgement in a suit brought for preliminary hearing concerning the interpretation of Articles 8 and 9 of the Protocol on the Privileges and Immunities of Euratom, the EEC and the ECSC.

IV. The Economic and Social Committee

115. — At its constituent session on 26 May, the Committee elected its officers, under the presidency of Mr. Giustiniani, and set up its specialised nuclear sections, one for social and health and safety problems, and the other for economic problems.

— At its session of 23, 24 and 25 June, the Committee heard a statement by Vice-President Medi on some aspects of the implementation of the research programme.

V. The Scientific and Technical Committee

116. Since 1963 it had become evident that the successful completion of the second five-year research programme, voted less than two years ago, was seriously compromised by the upward trend of wages and prices within the Community. It was therefore necessary to open discussions with the various competent authorities in order to see in what way the Commission could make up the resultant deficit.

In these discussions, which have continued throughout the year, the Scientific and Technical Committee took a very active part right from the outset. In fact, the greater part of its work during the year has centred on the problem of adjusting the appropriations and on the ancillary question of

the priorities to be accorded to the various parts of the programmes should the adjustment not be accepted by the budget authority.

From the beginning the Committee made clear its wish to limit its part in the budgetary discussion to the scientific aspects of the problem only.

At its meeting on 26 May, the Committee signified its agreement with a proposal of the Commission aimed at the substantial revision of certain items in the programme. In giving its opinion at the close of the debate the Committee stated that it could only accept with regret the cut-backs still necessary on some points as a result of this adjustment. Despite its limited scope, the adjustment should however enable the Commission to step up its efforts on the main projects, especially ORGEL, from which tangible results are expected in the very near future.

As a result of the difficulties which had arisen during the discussions in the Council, the Commission deemed it necessary in October last to refer the problem of revision of the programme once more to the Scientific and Technical Committee in order to see to what extent the compression or staggering of some projects might permit further savings to be made. After a very thoroughgoing discussion the Committee reached the conclusion that there could be no possible scientific motive to warrant the curtailment of a sum which was already insufficient to meet the needs of the programme; in these circumstances any further reduction would be tantamount to a political decision, which would by definition fall outside its terms of reference. The Committee therefore reiterated its view that the programme be maintained in essentials by stepping-up the appropriations by about 8.5% and stressed the modest nature of this increase in relation to the rise in salaries and prices, noting that any further compromise would entail jettisoning or delaying certain items in the programme, whereas the advance of science should rather require that activities be intensified.

In addition to this central problem the Committee studied various current questions relating *inter alia* to the Community's natural uranium supplies, the transportation of irradiated fuels from materials testing reactors in the Community and the guarantees covering European-made fuel elements. On this last point, it decided to set up a working group to submit proposals for the possible creation of a guarantee fund at Community level.

At its session of 26 May the Committee appointed Mr. Angelini as its President, the vice-presidency being held by Mr. Bugnard.

The Committee membership has undergone some changes during the year; following the resignations of Messrs. Gentner, Reuter and Stumper the Council decided to appoint Messrs. Born, Mandel and Dondelinger to replace them for the remainder of their predecessors' term of office.

VI. Consultative Committee on Nuclear Research

117. During 1964 the Consultative Committee on Nuclear Research held two sessions on 12 March and 5-6 May.

Session of 12 March

In view of the impossibility, owing to the trend of economic and social conditions, of carrying out the second research and training programme adopted in 1962 with the funds appropriated and within the deadline originally planned, on 12 March the Commission submitted to the Consultative Committee a proposal for an increase in the second five-year programme's budget based on an estimate of the changed economic circumstances.

Only one delegation took up a position at variance with that of the Commission, considering that the programme could be carried out *in toto* with the funds provided and within the period planned and that there were therefore no grounds for a revision.

The other delegations considered that any increase in the ceiling would have to be preceded by a study of possible savings.

Session of 5-6 May

Against this background, the Commission drew up fresh proposals and put two texts before the Committee. The first concerned the adjustment of the programme in line with the rise in prices and the cuts which the Commission thought it possible to make in some sectors, as well as embodying modifications to the programme stemming from technological advance.

The second paper bore on new projects which the Commission proposed to the Council for addition to the second research and training programme (basic research, completion of the SORA pulsed source reactor project, and the creation at Saclay of a European Institute for Training in Nuclear Techniques).

As regards the revision of the programme adopted in 1962, the Committee put on record its appreciation of the efforts made by the Commission to counterbalance its initial request for an increased budget, but was nonetheless unable to give a unanimous opinion.

The Committee also considered that the proposal for new projects should form the subject of a later examination.

VII. The Joint Services

1. *The Joint Press and Information Service*

118. The Joint Press and Information Service Board, of which Mr. Rochereau, a member of the EEC Commission, was the president up to September 1964, and which has since then been presided over by Mr. Colonna di Paliano, made every attempt to draw the attention of the appropriate authorities to the necessity for applying all suitable means to map out and implement a coherent and sustained policy concerning the publicity effort on the Communities and European integration.

A "memorandum on the Communities' information policy" was submitted in June 1963 to the EEC and Euratom Councils of Ministers and transmitted to the competent committee of the European Parliament (1).

The study of this memorandum was entrusted to a group of national information experts, who met together with the representatives of the Joint Service to examine the various technical aspects of Community information. Presented with the conclusions of this study, the Councils approved this report during their session of 7 July 1964.

In approving the report submitted to them, the EEC and Euratom Councils agreed on the desirability of stepping up the flow of information to the outside world without, however, reducing it within the Community. They also took note of a series of spearhead projects, including particularly publicity work in the United States, Britain, the Commonwealth, Latin America and the Associated States of Africa and Madagascar. Lastly, they voiced their consent to the setting up of a Press and Information Office in Latin America.

The Councils were largely guided by these conclusions in their examination of the budget proposals for 1965.

In line with the broad lines mapped out in the above memorandum, the Joint Service's work in 1964 had the following main aims:

1. To keep the general public, both inside and outside the Community, briefed on Community issues of topical interest. This task is closely linked with that of the three spokesmen responsible for the day-to-day issue of news items.
2. The thorough inculcation of a European spirit in trade union, agricultural and university circles, youth and adult education organizations, etc.

(1) See Seventh General Report.

3. The utilization, for this purpose, of all effective technical resources: the printed work, radio, television and cinema, fairs and exhibitions, courses of instruction and visits, etc.

The Service's main activities focussed on the branch offices in non-Community countries, the technical facilities employed and the effort directed at certain specific circles.

119. The offices already set up some years ago in the Member States (Bonn, The Hague, Paris and Rome) and the branch offices set up in some non-member countries (London, Washington and since 1964 New York and Geneva) are mainly responsible for keeping the local populations informed about the Community's activities as well as supplying Community institutions with data on the trend of public opinion in these countries.

The New York office has the special task of supplying information to United Nations circles, while the Geneva office deals both with the international organizations based in Geneva and with Swiss circles.

In 1965 an information office for Latin America will be opened at Montevideo.

In other countries, whether associated or non-member states, where no Community office exists, the attempt is made, insofar as a need is felt, to bridge this gap by the regular despatch of publications and information to private local study centres. This is done at Athens, for example, where a European Communities Information Centre was opened in 1964, and at Dublin where a similar centre is in operation.

Lastly, the "European Bookshop", to be opened in Brussels in 1965 on the premises of the Joint Press and Information Service, will have the task of setting up commercial relations with all large bookshops throughout the world which are capable of taking part in the dissemination of the publications issued by the Communities or bearing on the problems of European integration.

120. *Technical media.* Pride of place among the publications put out by the Joint Service is occupied by the six reviews intended for both intra-Community and British and American readers.

The purpose of these six publications, 130,000 copies of which are printed in the Community countries, 25,000 in Great Britain and 35,000 in the United States, is to capture the interest and sympathy of a very varied public, ranging from leaders in the political or professional sphere, teachers and students in higher education, to all those who simply as citizens welcome continuous and high-quality information on Community problems.

In addition to these reviews the Joint Service issued in 1964, in the Community languages, as well as in English, Spanish and Greek, 51 pamphlets with a total printing of 761,000 copies and eight folders with a total printing of 1,432,000 copies. A Euratom wall map and a folder of maps for use in schools were reissued.

At Brussels the picture library and the book library have been expanded in order to meet a growing public demand, particularly from journalists and university members. The publication of a reference card-index for use by universities and especially institutes of European studies is in preparation.

121. An important place is also given to audio-visual information—radio, television and cinema—although in this field it is less a question of direct production than of inducing those who control the mass-media to take a continuous and deep interest in European problems.

The TV programme “European Community”, planned and prepared jointly by the television networks of the six Member States, is now in its second series.

Several films or film-strips have been produced, especially on nuclear energy and the part played by Euratom.

Lastly, efforts have been continued to interest producers and directors in European subjects, in particular by the organization of European film congresses.

122. Alongside this information, which is addressed to a wide public, and often to the population of the big towns, participation in fairs and exhibitions enables a public of a rather different kind to be reached, whether technicians and professional specialists or the inhabitants of rural areas or middlesized towns, to whom regional questions are of particularly vital interest.

This year the Joint Press and Information Service took part in the “Grüne Woche” in Berlin, the “Salon de l’Energie” in Paris and the “ACHEMA” at Frankfurt.

In addition, the mobile exhibitions have continued their tours of France and Italy.

Lastly, in Germany, Belgium, the Netherlands, Great Britain and the United States, small mobile exhibitions are available to various bodies on application to the Press and Information Offices.

123. *Priority social areas.* During the past year 32 information courses were organized at the headquarters of Community institutions for international

groups of trade union leaders. At the same time 53 study week-ends or European day-conferences were held in the Community countries, including two week-ends in Germany for migrant workers.

As well as numerous courses and lectures in the permanent training centres and trade union schools, a trade union information bulletin, a special bulletin for the United States and monthly calendar of the main events in the trade union and labour world were published. Lastly, there was collaboration with various trade union periodicals and on a number of pamphlets published by the unions.

124. The importance of university and youth circles and of adult education organizations does not need to be stressed. Our institutions should remain particularly alive to their expanding interest in Community affairs.

As regards the former, considerable headway is being made in adapting education and high-level research in the face of the problems arising from European integration. The annual survey carried out by the European Community Institute for University Studies in cooperation with the various departments of the Community institutions has provided an indication of this progress, which is reflected not only in the growth of the number of institutes or centres dealing with European studies and giving specialized training to a limited number of students but also in the increasing number of lectures on European questions within normal faculty programmes, coupled with a greater quantity of theses and research projects.

The main duties of the Community departments have been firstly to rationalize the distribution of documents from the various institutions, and secondly, in liaison with the branch offices, to step up direct contacts with universities and institutes and with professors and students in the various regions inside and outside the Community.

Many university members have paid individual visits to Community headquarters. The number of theses recorded almost doubled between 1963 and 1964.

As regards youth and adult education circles, the activities previously initiated are being continued in the following two directions:

- schools, where thanks to the circulation of suitable articles and the organization of numerous teachers' meetings (more than 150 in 1964), syllabuses, textbooks and courses are devoting an ever-increasing amount of time and space to Community issues;
- youth and adult education organizations, whose staffs feel a growing need for detailed information in order to obtain a better grasp of the

complex nature of the integration in progress and its consequences for the professional and civic future of their charges, for if the intellectual élite of our countries can acquire the necessary knowledge of Europe during their university studies, the methods and syllabuses used in the instruction and education of the middle strata must be adapted so as to accomodate this trend.

The work undertaken in the fields of youth and adult education naturally requires contacts and consultation with the responsible government departments. With this object in view two information conferences were organized in 1964 with the high-ranking officials concerned with these questions in the six Member States.

125. In all other social fields the work of information is being systematically continued, particularly in the form of courses and visits to the head offices of institutions.

A total of 416 groups, numbering more than 12,600 persons in all, were received in 1964, more than half of them at Brussels. Some 60% of these were university lecturers and teachers, 20% socio-economic workers, 12% political leaders, 3% journalists, etc.

126. Lastly, the Community aims to expose a vast geographical area comprising the Associated African States and Madagascar and the other African states interested in the development of the Association to its information effort. In the absence of press and information offices in these countries the publicity work is carried out from Brussels.

2. The Statistics Office of the European Communities

127. During the period under review the Board of the Statistics Office held two meetings. In addition to certain budgetary, administrative and staff questions, it reviewed the work of the European Centre for the Training of Economic Statisticians from the Emerging Countries (CESD) at Paris, and studied a new method of calculating the joint index referred to in Article 65 of the Statute.

The Conference of the Heads of Statistical Offices met once during the year. The discussions centred particularly on certain technical questions arising from the relations existing between the departments of the European Executives and the national statistics offices, on the 1965 work programme, the long-term work programme of the Statistics Office of the European Communities,

the question of maintaining secrecy concerning the various statistical data and the problem of nomenclature.

Even more than in previous years the work of the Statistical Office was concerned with the collection and publication of current statistical data and the execution of relatively large-scale projects prepared in previous years pertaining to nomenclature, planning and surveys. We shall confine ourselves below to mention of some of the most important points.

As regards energy statistics, the Office has directed its efforts mainly to the preparation of a year-book giving data on all energy sources. In addition, it has amassed a copious amount of documentation on various aspects of the oil industry, which will be used for various purposes during the coming months.

The Statistics Office has prepared electricity statistics as part of the overall energy balances. In particular, detailed statistics on the stocks of the various types of fuel consumed in electric power plants are kept continually up to date. Current returns of the output of nuclear energy are now made by each power plant. Statistics on electrical equipment are now drawn up, starting from the year 1950. At the same time studies have been made of the electric power demand pattern, thus supplying the main load characteristics throughout the year.

As regards nuclear statistics, the Office has continued to amass data on foreign trade in nuclear products. Approaches have been made with a view to including in the industrial nomenclature certain activities of the nuclear industry.

3. The Joint Legal Service of the European Executives

128. Under the 1960 agreement reached between the three Executives in 1960 on the organization of the Joint Services, the management of the Legal Service has been carried out on the one hand by the Steering Board and on the other by the administrative services of the Euratom Commission. The Steering Board of the Legal Service, therefore, as in the past, dealt with questions concerning the overall organization of the Service, the Euratom branch of which has not undergone any appreciable changes during the past year.

On the operational level, the system of close liaison and mutual consultation established between the three branches of the Service was maintained and consolidated by the study of questions of common interest to several Com-

munities, especially those concerning the principles and common denominators of Community law and those connected with Personnel Administration and the implementation of the Statute.

As regards the specific tasks falling within the purview of the Legal Service has continued, as in previous years, to be closely associated with all the Commission's activities. It has been regularly consulted on all legal issues relating to the interpretation and implementation of the Treaty and Community acts, and on the drafting of the various instruments adopted by the Commission; it has been closely associated with the preparation of the Commission's proposals to the Board aimed at the amendment of Chapter VI of the Treaty concerning supply.

VIII. Inter-Executive Cooperation on Energy

129. Let us briefly recall that the ECSC Council of Ministers set up in May 1963 a special Energy Policy Committee made up of high officials of the Member States and the three European Executives. This Committee was instructed to report to the Council on the measures to be adopted to overcome the problems raised by the Community's energy situation and the progressive implementation of a joint energy policy. Its proposals were to be in keeping with the Memorandum on Energy Policy drafted by the three Executives in June 1962 and with the positions adopted by the Ministers at Council debates on this Memorandum.

After the ECSC Council of Ministers had refused on 3 December 1963 to approve a draft resolution drawn up by the special Committee proposing certain coordination measures, the High Authority took the initiative in preparing a new draft aimed primarily at avoiding a widening of the gulf between national coal policies.

After discussion held first with the Brussels Commissions and then in the six capitals, the High Authority submitted its proposals to the special Energy Policy Committee. This Committee adopted at its meeting on 7 April a text based on the draft resolution already before the Council, but embodying some of the main provisions of the High Authority's draft.

The Euratom Commission approved this text for the following two main reasons:

- it enables the High Authority to propose the Community system of aid to the collieries which it considers essential,
- it affirms the governments' determination to map out a joint energy

policy based on factors and objectives matching those set out in the Memorandum of 25 June 1962.

At its meeting in Luxembourg on 21 April 1964 the Special Council of Ministers of the ECSC unanimously adopted the "Protocol of Agreement on Energy Questions".

As regards nuclear energy, the protocol affirms the governments' willingness, within the terms and subject to the provisions of the Treaty establishing the ECSC, "to promote and intensify the work of research, experiment and aid to nuclear industrial development within the Community in order to enable this new energy source to make a maximum contribution as soon as possible and in economic conditions to covering the Community's energy requirements."

Acting on the basis of Paragraph 11 of the protocol, under which it is invited to make procedural proposals for setting up a Community system of aid provided by the states to the collieries, the High Authority again took the initiative in September.

Its efforts, with which the Brussels Commissions were associated, resulted in the submission to the session of the Special Council of Ministers of the ECSC on 10 December 1964 of a draft decision concerning the Member States' assistance to the Community's coal industry.

This assistance, which in principle is forbidden by the Treaty of Paris, is nowadays recognized as essential in order to enable the coal industries to adjust themselves to the new situation in the energy market. They are mainly social subsidies and grants to promote rationalization measures.

The proposals advanced by the High Authority stipulate that:

- the States should notify the High Authority of any legislative or administrative provisions relating to social benefits in the coal industry which have come into force since January 1963, together with the funds from which they are financed;
- the High Authority, after consulting the Council, should authorize the States to award grants for positive and negative rationalization measures; as regards negative rationalization measures, the grants awarded for the partial or total closure of mines may be used only to cover certain duly justified and clearly delimited expenses.

As regards grants towards positive rationalization, the High Authority may authorize them insofar as firms can prove that they comply with well-defined conditions. These grants relate to investment expenditure of all kinds and to recruitment and training outlays.

Other forms of grant may also be approved by the High Authority, on the unanimous opinion of the Council, with a view to overcoming exceptional difficulties which might lead to serious upsets within the Community. The authorization is valid for one year only, but is renewable.

In all cases the High Authority may attach guarantee provisos to its authorization. It may conduct checks on the firms' premises and impose minimum prices in cases where grants are misused.

On 10 December the Council's proceedings were limited to a discussion on these proposals. The delegate body was unanimous in delivering a favourable opinion on the High Authority's proposals. However, a request was made for certain technical clarifications to be made in the text.

At the meeting of the Council of Ministers on 4 February, five delegations expressed agreement in principle with the High Authority's draft decision. On 17 February the Dutch Government also gave an affirmative reply to the High Authority.

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PUBLICATIONS DEPARTMENT OF THE EUROPEAN COMMUNITIES
3722/5/1965/6

For the two volumes :

FB 150,—	Ffr. 15,—	DM 12,—	Lit. 1.870,—	Fl. 11,—
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