

EUROPEAN ATOMIC ENERGY COMMUNITY
E U R A T O M
THE COMMISSION

TENTH

General Report

on the

Activities of the Community

(March 1966 - February 1967)

APRIL 1967

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INTRODUCTION

Access to new energy sources has become a vital necessity throughout the world; the European Community, constrained to provide for its economic expansion in the near and distant future, has felt this need particularly keenly.

Nuclear energy has emerged over recent decades as the most potent means of meeting the demand for power, which, as everyone knows, is growing with exceptional rapidity.

On the initiative of enterprises, national bodies, Community institutions, and always with an eye to the obligations of international collaboration, Europe has girded itself to move into the nuclear industrial age under the right conditions.

Euratom's particular task has been to participate in the efforts in that direction by instigating, fostering, supplementing and extending them, so as to "contribute to the raising of the standard of living in Member States and to the development of trade with other countries".

At the risk of repeating things already said in previous annual reports, the Commission thinks it worth while recalling, in broad outline, certain of the activities achieved by the European Atomic Energy Community, and more especially by the Euratom Commission.

The duties laid on the latter by the Rome Treaty are too numerous to quote here, and indeed have been defined often enough. The circumstances in which they have been carried out are dealt with further on in this Introduction. Certain of these duties entailed the preparing of proposals to be submitted within the time-limits laid down by the Treaty. Examples of this are:

- sending the Assembly an overall situation report on nuclear industries in the Community (Art. 213);
- proposals on the establishing of basic standards (Arts. 31 and 218);
- proposals concerning the procedure for running the university-level institution;
- proposals relating to the Statute of the Supply Agency (Arts. 54 and 220);
- the Report on the implementation of the research and training programmes (Art. 7, Para. 4);

- negotiations for the establishment of the Common Customs Tariff applicable to List A2 products (Art. 94 b).

The deadlines imposed by the Treaty were met in each case.

In other cases, arrangements were concerned only with the subject-matter of the proposals to be put forward by the Commission, no time-limit being fixed. Among these questions were the starting-up of the Supply Agency, the preparation of target programmes, the submission of opinions on nuclear investments to be made in the Community, the organization of safeguards and controls, and the enquiry into research. Where no deadline was laid down, the work was carried out promptly.

Generally speaking, the Euratom Commission proceeded on the assumption that nuclear energy would soon reach the industrial stage. Its policy in this context may be summarized as follows:

It organized, under conditions which there is no need to recapitulate, a vast research network the development of which can be followed from the successive annual reports.

It was at pains to ensure full compliance with the special health and safety measures necessitated by the use of nuclear equipment.

As regards the risks liable to arise despite the precautions taken, it cooperated in the setting-up of an insurance system compatible with large scale and rapid development of nuclear reactors and of the irradiated substances involved in their operation.

It laid the foundations of a common supply policy and has made the services of the Supply Agency available to the Community.

Finally, it has concerned itself with making provision for the activities which have a technological bearing on reactor operation, and in this connection mention must be made of the following fields in which the Commission has been active:

- participation contracts enabling the entire Community to benefit, before the reactors became competitive, from certain experiments launched in the Community;
- steps taken with regard to Joint Enterprises;
- guarantees furnished concerning the fuel cycle;
- efforts with regard to the transportation of irradiated products;
- work on the processing and storage of radioactive waste;
- dissemination of information for the benefit of the entire Community and the development of a semi-automatic documentation system;
- international commitments undertaken on behalf of the Community;

- action on the supply of natural uranium and special fissile materials;
- development of the nuclear common market;
- standardization of technical regulations and specifications.

In many sectors, therefore, solutions have been achieved which are already proving economic and of considerable value, but the Commission is bound to emphasize that a great deal remains to be done, particularly in the sphere of technology proper, where it is essential to realize the full potential of fission energy.

This, then, is the background to the work accomplished to date and to that which has to be continued or has yet to be started.

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At the time this Report is submitted to the European Parliament, ten years have elapsed since the signature of the Rome Treaties.

In the context of this anniversary, it may be of interest to compare the present situation of nuclear energy in the Community with the forecasts made during the period in which the Treaty gradually took form.

These forecasts assumed that by 1967 the share of imports in the Community's energy supplies would have reached 30% and that at the same point two-thirds of the Community's electrical energy would be derived from "non-privileged" sources, with a possible contribution from nuclear energy under this head. Hence the desirability of developing this new source apace in order to limit the Community's dependence on the outside world.

An examination of the present position reveals that these forecasts have been overtaken by events. The proportion accounted for by imported energy has, in fact, risen to about 50%, while the trend of electricity requirements and of their satisfaction from non-privileged sources has been more or less in line with the forecasts. If, on the other hand, nuclear energy's attainment of its industrial majority is lagging several years behind the estimates made back in 1957, this is because of the glut which developed on the energy market at the very moment that the Treaty came into force and the resultant drop in prices of conventional energy. This state of affairs, coupled with a rather more leisurely pace of technical advance than anticipated, inevitably led to a redoubling of efforts to make nuclear energy competitive with conventional sources. Thus installed capacity, which in 1967 only amounts to 2350 MWe, will by 1970 have topped the 4000 MWe mark scheduled in the target programme, but not until 1975 will the Community — under the same programme — have a nuclear capacity of 17,000 MWe, which was originally thought to be attainable by 1970.

It is worth noting in this context the view expressed in 1957 that Europe might be several years ahead of America in the industrial exploitation of nuclear

energy because of the very low level of conventional energy prices in the United States and the greater difficulties which the latter would have to overcome in order to make nuclear power competitive.

This forecast is seen to have been refuted by recent events. The major breakthrough of nuclear energy has actually been in the United States, where in 1966 more than half the power plants ordered, representing a total capacity of 21,000 MWe, were nuclear. The most sensational development in this regard was the Tennessee Valley Authority's decision to build a nuclear power plant with a total output of 2200 MWe in the heart of an important coal basin.

That the argument outlined above, wholly logical though it is, has proved fallacious is seen upon reflection to be due in large measure to the United States' industrial potential, backed as it is by a vast home market.

The Community does not enjoy the same favourable conditions for technological development. The complete abolition since 1959 of internal duties on and quantitative restrictions on trade in nuclear products could not in itself effect the necessary concentration of industrial capacity and specialization by the various industries in the Community. As it happened, the hiving-off of the national markets was scarcely affected at all by these measures. In concrete terms, the Community's research and training programme has been the first project to lead to a certain opening-up of frontiers in this field. Furthermore, the dovetailing and coordination of the investment and operating programmes of the Community's electricity procedures are not being pushed ahead as well as they might (and are being in the US).

The result is that in some Community countries there has still been insufficient exploration of the possibility of producing nuclear electricity at more favourable cost through setting up larger production units.

To sum up, the implementation of Chapter IX of the Treaty, which aims at the establishment of a nuclear common market, has hitherto neither eliminated obstacles other than those inherent in customs barriers and quantitative restrictions on trade nor, in itself, served to modify the very different structures of those industries in the Member States which in varying degrees are subject to the influence of the public authorities.

Now that research and development efforts have borne their first fruits and a market for nuclear power plants has started growing inside the Community and is expected to expand rapidly, these are the objectives towards which a major proportion of Community activity must be channelled.

As regards the structures of the electricity-producing industry, this policy will become easier every year as the growing demand makes more and more room for the large unit capacities in which nuclear energy can be turned to account most profitably.

As to the reactor construction industry, the economic chapters of the Euratom Treaty contain provisions which must be used more widely in the future

than they have been in the past; they would, indeed, be more effectively implemented if accompanied or followed by more comprehensive Community action to enable European industry in general to adjust itself to the new economic field now opening up. For it must be borne in mind that the nuclear field is not really a separate sector; on the contrary, it is intimately linked with conventional branches of industry and more especially with the large-scale electrical equipment manufacturing industry.

For some months now the Commission has been studying all these industrial questions with a view to amplifying the proposals as to its future action in the field of research and training which it set out in the target programme tabled in March 1966 and in the proposals submitted to the Council of Ministers in February 1967.

The second five-year research programme runs out at the end of 1967. Consequently, the Commission spent the second half of 1966 in preparing a document which contains its proposals concerning the development of research after 1 January 1968. These proposals take account of the circumstances described above and of the results of nine years of existence.

In the decisions to be adopted, the Community authorities will be called upon to consider the following choice of attitudes with respect to specific problems which hitherto have been the subject of Community action in this field:

- to continue current lines of action in the same form and by similar means;
- to continue certain activities, but by other means and procedures than those employed during the Community's first years of existence;
- to abandon certain activities, not in the sense of applying a brake to Community research, but with the object of altering the distribution of effort among the national and Community bodies responsible;
- to launch new activities, economic in particular, consonant with the situation at it has evolved today, by comparison with the situation prevailing in 1957 or 1962 (when the second five-year programme was drawn up).

In the document referred to, the Commission declares its views and invites the Council to adopt one or other, depending on the problem, of the attitudes listed above. At the moment of declaring in favour of developing research after 1 January 1968, ways and means can only be estimated if the tasks are first agreed upon. It is with reference to this preliminary, interlocutory decision that the Commission's proposals are put forward.

The Commission also considers that the proposals on research development must be examined in the light of three courses of action made possible by Treaty provisions, which if combined would allow of greater flexibility and efficacy than has hitherto resulted from over-exclusive resort to the provisions of Article 7

only of the Treaty. Here the Commission is once more expressing a view which it has already felt bound to put forward on several occasions, including that of its Ninth Annual Report to the European Parliament.

These three courses of action are the following:

- the direct administration of a joint programme drawn up in line with the provisions of Article 7 and financed in accordance with the system laid down in Para. 2 of Article 172;
- certain specific projects, either drawn up in line with the conditions of participation enumerated in Article 7, but with a possibility of amending the contribution scales, as allowed for in Para. 3 of Article 172, or implemented under variable conditions of participation and financing, as laid down in Para. d) of Article 6, or coming under the provisions listed in Chapter V;
- all support, for which, incidentally, no special financing is required, which the Commission can render to Member States, persons or enterprises in accordance with various provisions in the Treaty, and notably those contained in Article 6, Paras. b) and c), and Articles 8 and 9, and also by placing its entire services at the disposal of those who require them.

The Joint Research Centre with its teams of scientists, its laboratories and equipment, as well as the facilities for carrying out studies or tests which it acquires under Associations, constitutes a potential that the Community could not reasonably forego. Any programme of action presupposes the preservation of this asset for the benefit of the Community, that is to say for all parties in the Member States who are engaged in nuclear research and nuclear industry.

But these activities are only some of the obligations laid down by Article 2 of the Treaty. The others, notably, dissemination of information, health protection, supplies, the industrial sector, instruction and training, have received the Commission's closest attention and have paved the way for future developments. The resources at the Community's disposal should enable it to achieve the goals that have been set.

The nuclear sector provided the first model for a research organization. Now, however, there is a growing awareness that these efforts must be extended to other fields of advanced technology in order to safeguard the Community's role as an industrial power able to stand up to world competition. This conviction is largely echoed by the European Parliament.

Following a wish expressed by the European Parliament, the Interexecutive Working Group on Scientific and Technical Research — in whose work the Euratom Commission participates side by side with the High Authority and the EEC Commission — has drawn up a memorandum on the problems raised by scientific and technical progress in the European Community. This memorandum was recently transmitted to the Council of Ministers. The said document, to

which is attached a draft resolution, contains a number of analytical data and preliminary thoughts on certain desirable trends.

Definition of the Community's future activity in the realm of nuclear research, extension of Community efforts to problems of advanced technology in general, the accent that will henceforth have to be placed on the problems of industrial structure — these are the main points that mark the Community's situation ten years after the signing of the Rome Treaties and on the eve of important changes in its internal structure.

As the Commission has emphasized in its previous reports, the new unified structure will offer a chance of more effectively tackling this task, which, however difficult it may be, is essential to the economic construction of Europe.

I. Present Position of and Outlook for Nuclear Energy

1. The first Euratom target programme, drawn up in 1965 and published in 1966 after submission to the Economic and Social Committee, gave rise to broad consultations among governmental, industrial and professional circles concerned in various ways with the prospects opened up by nuclear power for electricity generation.

In the light of events and research carried out since then, minor alterations can already be made to the technical and economic considerations contained in the programme.

2. These new data do not affect the Community's energy situation in general, which continues to develop, as forecast, along the lines of growing dependence on outside sources — a dependence destined to increase yet further as time goes by. The trend is reflected in the document drawn up by the three Communities under the title of "Further Considerations on the Long-Term Energy Outlook for the European Community"¹⁾ and also in the report entitled "Energy Policy, Problems and Aims" published by the OECD²⁾.

In 1966, the Community consumed primary energy running to some 620 million tons of coal equivalent (tce = 7000 Kcal/kg) and it is estimated that requirements will be 750 million tce in 1970 and 910 million in 1975.

Before the last war, coal mined in the countries of the Community accounted for 85-90% of all energy consumed. The proportion had dropped to 30% by 1966, and the constant pressure of extraction costs, coupled with marketing problems, is likely to reduce that percentage still further. In the view of the ECSC High Authority, the quantity of coal mined should decline from approximately 200 million tce in 1966 to 185 million by 1970, but the output statistics for 1967 indicate already that the figure will be even lower.

¹⁾ ECSC Bulletin, High Authority, Luxembourg No. 61 (1966).

²⁾ OECD, Paris (1966).

The proportion provided by lignite (5.6% in 1966) and by hydroelectric energy (7.9% in 1966) will likewise decrease. The only exception among indigenous sources of primary energy will be natural gas; its share, at present put at 4.4%, will rise to 8-10%, perhaps more, by the end of the decade.

In this changing pattern of energy supply, the greatest benefit accrues to oil. Where before the last war it represented less than 10% of the total consumption, it had advanced to 48% by 1966 and will doubtless continue to rise two or three points each year.

Only half the primary energy consumed in 1966 came from Community sources. Imports consisted chiefly of crude oil (more than 90%), coming largely from the Middle East (some 60%) and North Africa (Libya) and Algeria (some 30% of the total), along with refinery products.

Inherent in this situation is the problem of dependability of supply. This can be ensured by stepping up domestic output, by adopting a stock-piling policy or by diversifying imports. In this context, nuclear power can contribute appreciably towards solving the problem of the Community's energy dependence, since it offers scope for holding imports in check. Hence the arguments for increasing recourse to nuclear energy as set forth in the target programme remain as cogent as ever. Particularly significant among those arguments, apart from the fact that the Community can only meet a rapidly shrinking part of its requirements from the traditional resources of its territory, is the consumers' clear preference for secondary forms of energy as manifested, *inter alia*, by the persistent growth in electricity demand. In 1966, consumption touched 420 thousand million kWh, leaving aside the power plants' own consumption. Since 1950, domestic demand has risen by an average of 8.25% annually and is expected to double again in the next ten years, representing a mean annual rise of slightly over 7%.

3. In keeping with the general energy situation as outlined above, the installation of nuclear capacity is going forward as intended. In the six countries combined, more than 8300 MW_e of nuclear generating capacity are in commission, under construction or planned.

Power reactors in operation account for 2106 MW_e. Their main features are set out below.



LINGEN (West Germany) — VIEW OF POWER PLANT

(See other side of page for caption)

At Darme near Lingen, the Kernkraftwerk Lingen GmbH is building a power plant to be run on a 250 MWe boiling-water reactor. The main contractor is AEG. In 1964 it was accorded the status of a "Joint Enterprise" as defined in the Euratom Treaty — a form of company under European law which is granted tax and customs concessions.

CHARACTERISTICS OF REACTORS IN COMMISSION

Reactor and site	Country	Type ¹⁾	Went critical	Connected to grid	Capacity in MWe
BR-3/Mol	B	SSR	—	6.12.66	10
SENA/Chooz	B-F	PWR	19.10.66	1967	266
VAK/Kahl	G	BWR	13.11.60	6.61	15
MZFR/Karlsruhe	G	HW	29. 9.65	8.66	50
KRB/Gundremmingen	G	BWR	14. 8.66	12.11.66	237
AVR/Jülich	G	HT	26. 8.66	—	15
G1 Marcoule	F	GG	7. 1.56	9.56	3
G2 Marcoule	F	GG	21. 6.58	22. 4.59	40
G3 Marcoule	F	GG	11. 6.59	4. 4.60	40
Chinon-1 (EDF-1)	F	GG	16. 9.62	14. 6.63	70
Chinon-2 (EDF-2)	F	GG	18. 8.64	24. 2.65	200
Chinon-3 (EFD-3)	F	GG	1. 3.66	4. 8.66	480
EL-4/Brennilis	F	HW	23.12.66	—	73
ENEL/Latina	I	GG	27.12.62	12. 5.63	200
ENEL/Garigliano	I	BWR	5. 6.63	23. 1.64	150
ENEL/Trino Vercellese	I	PWR	21. 1.64	15.11.64	257

- ¹⁾ GG = gas/graphite reactor
 PWR = pressurized light-water reactor
 BWR = boiling light-water reactor
 HT = high-temperature gas reactor
 HW = heavy-water reactor
 SSR = spectral shift reactor

On-stream reactors provided 5300 million kWh net in 1966 compared with 4400 million in 1965. The contribution of the several countries was:

(thousand million kWh)

	West Germany	France	Italy	Community
1965	0.1	0.9	3.3	4.4
1966	0.2	1.4	3.7	5.3

Reactors at present being installed will have a total capacity of 2205 MWe, which breaks down as follows:

Reactor and site	Country	Type	Capacity (MWe)
KWL/Lingen	G	BWR	173
KWO/Obrigheim	G	PWR	300
KNK/Karlsruhe	G	sod./zir.-hydr. ¹⁾	20
HDR/Kahl	G	nucl. sup. ²⁾	25
KKN/Niederaichbach	G	HW	100
St. Laurent-1	F	GG	480
St. Laurent-2	F	GG	515
Bugey-1	F	GG	540
GKN/Dodewaard	N	BWR	52

¹⁾ Sodium-cooled, zirconium-hydride-moderated prototype.

²⁾ BWR nuclear superheat reactor.

For other abbreviations, see footnote to preceding page.

From the above two tables it will be seen that the figure aimed at for 1970 in the target programme, namely, 4000 MWe installed capacity, will certainly be reached.

The following is a breakdown into reactor types of all the nuclear plants in commission and under construction:

59% gas/graphite

15% boiling light-water

19% pressurized light-water

5% heavy-water

1% other types

As regards reactors at the design study stage or projects with good chances of realization, mention may be made of the following, whose capacities add up to 4020 MWe:

Reactor and site	Country	Capacity (MWe)
NWK and others (Stade, Elbe)	G	600
Preussen-Elektra and others (Würgassen, Weser)	G	600
RWE/Baden-Werk and Elecktrawatt (Upper Rhine) ¹⁾	G/CH	300
Geesthacht (Schleswig-Holst.)	G	20
Fessenheim-1 (Alsace)	F	700
ENEL (Northern Italy)	I	600
EBES (Antwerp)	B	600
Intercom (Huy)	B	600

¹⁾ The scheduled capacity of this plant is 600 MWe, shared between Germany and Switzerland, but is shown as half that figure in the table, which applies only to the Community.

From the standpoint of achievement and participation by the Member States, the position is as follows:

BREAKDOWN BY COUNTRIES ²⁾

	Belgium	W. Ger- many	France	Italy	Nether- lands	Com- munity
Reactors in commission	143	317	1039	607	—	2106
Under construction	—	618	1535	—	50	2203
Planned	143	935	2574	607	50	4309
Total	1200	1520	700	600	—	4020
	1343	2455	3274	1207	50	8329

²⁾ In MWe of installed capacity.

4. The total of 8329 MWe for the Community must be set against the figure of 45,000 MWe generally assumed for the capacity of nuclear power plants in operation, under construction or planned throughout the world. The comparison shows clearly that nuclear energy is developing fast in countries outside the Community today.

Aggregate capacity of nuclear power plants in service, under construction or at the design stage in Community countries is in fact modest, compared with the corresponding statistics for the United Kingdom and the United States. Britain's first nuclear power programme exceeds 5000 MWe, while the second envisages the commissioning of about 8000 MWe between 1970 and 1975.

Progress is especially impressive in the United States, where orders placed during 1966 covered 21,000 MWe (against some 5000 MWe in 1965), which is rather more than half the total of new installations ordered. Allowing for existing nuclear power plants and for projects currently under construction, the United States will have something approaching 30,000 MWe of nuclear capacity around 1971/72.

The decision of the Tennessee Valley Authority affords an eloquent example of the spectacular breakthrough of nuclear energy in the United States. During the past year, the TVA placed an order for a nuclear power plant equipped with two light-water reactors of 1100 MWe each, to be built in an area well placed as regards coal supplies. Under the customary conditions of financing in the United States (the TVA enjoys special status as to taxation and finance), the installed cost will be of the order of \$115 per kWe and the cost of the power produced 3.5 mills per kWh, giving an approximate price of \$5/tce.

5. This trend among American electricity suppliers will most probably lead to a revision of long-range forecasts. Back in 1964, the figure of 40,000 MWe envisaged for 1980 by the USAEC in its Report to the President at the end of 1962 was adjusted to a 60,000-90,000 MWe span; it was again raised to the 80,000-110,000 MWe bracket a few months ago. The second of these estimates could well be far exceeded, even if orders for nuclear power plants were not to continue in the coming year or two at the rate witnessed in 1966.

As far as the Community is concerned, the target programme published in the "Journal Officiel" of 28 April 1966, it will be recalled, sets a minimum target for 1980 of 40,000 MWe installed nuclear capacity.

However, the very favourable prospects outlined above cannot fail to have repercussions in the Community. European electricity suppliers are not blind to the fact that nuclear power is now clearly competitive in the United States, even though fossil fuels are much cheaper there than in Europe.

In *West Germany* it seems certain, according to a statement made on 12 October 1966 by the Minister for Scientific Research, that 25,000 to 30,000 MWe will be reached in 1980, which is double the nuclear capacity forecast for that country in the target programme.

As to *France*, the only indications given by the Fifth Plan foreshadow 45,000-60,000 MWe in 1975 and 17,000 MWe in 1980. This latter figure would seem to be borne out more so than that of 12,000 MWe embraced in the

Community's 40,000 MWe target by the fact that the upper limit of the 4500-6000 MWe bracket will very probably be reached. Indeed, the last report of the French Atomic Energy Commission (CEA) envisages the virtual ousting of conventional thermal energy by nuclear energy for new power plants as early as 1973.

For *Belgium*, no specific programme has been made public but it seems that after installation of the 1200 MWe scheduled for 1972/73, a start is expected to be made on other units which will bring installed nuclear capacity up to about 4000 MWe by 1980.

In *Italy*, ENEL's projects, as confirmed by its Director-General last December, cover a programme of nuclear power plant construction between now and 1970, consisting in the ordering of a 650 MWe plant in the near future, to be followed by a further 2000 MWe. Thus by the end of 1970 ENEL will be ordering some 2600 MWe of nuclear capacity, representing on average one 650 MWe power plant each year. While ENEL has not yet drawn up firm plans for the period 1970-80, there can be no question of diminishing the pace of nuclear power plant construction. Its projects may even be expected to total at least 10,000 MWe, having regard to increased experience, the growing competitiveness of nuclear plants and the rising demand for energy. It is therefore not unreasonable to suppose that installed nuclear capacity in Italy may amount to 12,000 MWe in 1980.

To turn finally to the *Netherlands*, the Minister for Economic Affairs, in a statement to the Dutch Lower House on 8 June 1966, estimated at between 1500 and 2000 MWe the total capacity of nuclear power plants which are to be erected between 1970 and 1980.

In view of the foregoing, present indications concerning installed nuclear capacity in the *Community* in 1980 (cumulative capacities, in MWe) may be summed up as follows:

	Belgium	W. Ger- many	France	Italy	Nether- lands	Com- munity
1980	4,000	25,000	17,000	12,000	2,000	60,000

Hence there are grounds for considering a net figure of 60,000 MWe nuclear capacity as the minimum objective for the Community in 1980.

6. The first Euratom target programme, drawn up in 1965 on the basis of information then available, also recommended the harmonious and simultaneous development of nuclear energy in three generations of reactors, namely

proven-type reactors, advanced converters and fast breeders. This programme model has been retained because it involves minimum expenditure in both absolute and present-worth terms, along with minimum demands for natural uranium.

Since mid-1965, that is, since the conclusion of the preparatory work on this programme, certain new developments have occurred which affect the economics of, and the conditions of supply for, the reactor types in question.

In France, where in the field of proven-type reactors development of the *gas-graphite* family is going forward, the first phase of the Bugey plant (547 MWe) will use annular fuel elements. This method gives promise of appreciable cost reductions when transposed to power plants of the order of 1000 MWe. With the technique as now practised, the most economic power plant seems likely to be Fessenheim-1, which is up for tender. It is hoped to raise its capacity to 700 MWe while keeping the reactor size down roughly to that of EDF-4. The cost per kWh would in that case be comparable to the figure for a light-water reactor of equivalent capacity.

Under the head of advanced reactors, mention should be made of the Dungeness-B group of *AGR reactors*. According to the latest calculations, the construction cost is likely to work out at \$220/kWe and, on average terms of financing prevailing in the Community, the cost per kWh at 5.2 mill. Salient features of this first AGR power plant are a new fuel-element design, on-load charging and discharging, and its highly compact structure. The fuel is slightly enriched (2.26%) and a burn-up in the region of 20,000 MWd/t is predicted.

Research is also continuing on four *heavy-water reactors* types (using light water, heavy water, carbon dioxide and organic liquid as coolant). Studies have been made in the Community to compare available costings relating to the organic liquid, heavy water and CO₂-cooled series. They show that, while the advantage of first-generation heavy-water reactors over light-water reactors is open to question, the second generation, where the trend is towards using enriched uranium, offers prospects of costs 10-15% lower than for light-water reactors, despite the improved performance, bringing the cost of electricity produced in this way down to 4.25 mill/kWh for an annual utilization time of 7000 hours and on the basis of an annual charge of 10% on the capital investment.

Various data have been issued concerning *high-temperature gas reactors*; construction costs are reckoned at around \$165/kWe for a 500 MWe unit, with electricity costing probably 3.5 to 4 mill/kWh according to whether the fissile material bred is recycled or not.

The many interesting data communicated on the subject of *fast reactors* will probably lead to an upward revision both of the economic parameters and of those relating to specific output and requirements of plutonium. British

calculations forecast a construction cost of \$155/kWe and a cost per kWh of 3.2 mill for plants of 2×1000 MWe. On the other hand, advocates of the steam-cooled fast reactors consider that their costs should be little if anything more than those of their sodium-cooled counterparts.

Fast-reactor development is thus progressing favourably and industrial maturity for this type is still expected to be attained around 1980. The Euratom Commission believes that such reactors will be fuelled mainly with plutonium, the shortage of which will be a diminishing risk in the years to come as decisions are taken to install ever greater nuclear capacities in the Community.

7. Notwithstanding these new facts that have arisen since the target programme was drawn up, the Euratom Commission believes that the development model to which it has pinned its faith, providing for development of three generations — proven-type reactors, advanced converters and fast breeders — is still a sound one. It is convinced that the advantages offered by fast converters warrant proceeding with their development, even though the relative advantage of this model may be less, particularly as compared with the model going straight on from proven-type reactors to fast reactors. Advanced converters will have a slight economic edge on proven-type reactors and there is the added consideration that the greater amounts of fissile material they breed may assist in speeding up the introduction of fast reactors when the time comes. Finally, it will be seen that, while the economics of fast breeders look favourable as compared with the prospects for advanced converters, the gap is not a wide one. Bearing in mind the time needed to perfect fast reactors and the technical unknowns still outstanding, it would hardly be proper to halt the research and development work on advanced converters.

II. Nuclear Industry

A. POWER REACTORS

1. *Proven-type reactors*

8. Although the short and medium-range outlook for the construction of proven-type reactors is good, the year 1966 may be regarded as a period of cautious preparation and wait-and-see on the part of operators. There have been declarations of intent, invitations to tender have been issued, but no firm orders for high-capacity plants have resulted.

Generally speaking, the construction industry is going through a phase of readjustment and manifest redeployment in several of the Community countries.

The resultant concentration of effort is a good thing, though not yet good enough to remedy excessive dispersion, bring about the necessary coordination of investments and obviate a certain compartmentation of the market.

Where the construction of light-water reactors is concerned, the Community industry is in a position, by virtue of technical agreements or licensing arrangements with non-Member States and its own development efforts, to supply everything needed for complete power plants.

Construction of the gas-graphite reactors already decided on is proceeding according to plan in France. However, the French authorities consider that, for future programmes, exploration of the possibilities of one or other proven-type reactor family using enriched uranium, in addition to the natural uranium series, should not be ruled out.

The further development of proven-type reactors rests mainly with industry; technical sectors still calling for development studies are few and clearly defined. What has to be done is:

- the data obtained from power plants in operation must be used so as to turn the information to the best advantage from the standpoint of reducing costs per kWh and of improving methods of calculating core designs and the system for repositioning fuel assemblies in the reactor;
- the validity of concepts elaborated under research contracts must be demonstrated (and specifically, twisted-tape fuel-rod elements and plutonium recycling);
- the necessary conditions must be created for nuclear energy to come of age and for the elimination of all technical obstacles to the establishment of a true common market, i.e., the systematic exchange of experience in the building and operation of nuclear power plants; comparison of methods of assessing safety problems; keeping manufacturers regularly informed; technical assistance to operators desirous of entering the nuclear energy field; help in the formulation and harmonization of industrial standards, etc.

2. *Advanced converters and fast-neutron reactors*

9. The need for advanced reactors in the development of nuclear energy in the Community has been highlighted in Part I of this chapter. An obstacle to their breakthrough is that operators, already confronted with the introduction of a new technique which has only recently come into its own, are naturally hesitant about branching out afresh.

Nevertheless, the construction of a number of advanced-type power-reactor prototypes is essential in order to demonstrate their industrial and economic potentialities. Only in this way is it possible to determine the actual extent of the technical problems in their true context.

Some manufacturers, alive to the future possibilities offered by advanced converter reactors, are taking an active interest, but technical development is too limited and the financial risk too great for that kind of initiative to be followed through without backing from the public authorities and the collaboration of the Commission.

A similar situation will arise in respect of fast reactors, but here the construction of prototypes cannot be contemplated before 1969/70.

Rational solutions must therefore be found fairly soon if the Community is to maintain its position in the world nuclear market and reap its just reward for its outlay in manpower and money and the technical potential invested in these methods.

B. NUCLEAR SHIP PROPULSION

10. Compared with land-based reactors, marine reactors are subject to stricter requirements as regards safety, manoeuvrability, mechanical strength, weight and compactness, and also with respect to long core life, which is difficult to achieve in a small reactor.

The mere fact that there is only one nuclear-propelled merchant vessel on the stocks in the Community, the "Otto Hahn", shows that the industrial stage has not yet been reached. Finance for this ship, which is designed and equipped chiefly for research purposes, is drawn solely from German government funds and Euratom.

However, as will be seen from what follows, nuclear propulsion may well be used in merchant fleets before many years have elapsed.

Some countries are spending considerable sums on the development and construction of nuclear-propelled naval vessels. Published information shows that funds have been voted for 112 submarines in the United States, the United Kingdom and France, more than half of them already being in operation.

On top of this, the US Navy has three nuclear-propelled surface vessels in service. The fund of experience gained here can to a large extent be turned to account in the construction of reactors for merchant ships.

Furthermore, there is a tendency to employ high-power propulsion units in certain branches of merchant shipping, and here the nuclear reactor offers advantages. The trend is towards increasing numbers of fast cargo ships with the turn-round time in port speeded up to give about 300 days a year at sea, or some 100 days a year more on average than with other types of ship, apart from oil tankers. The cruising speeds and hence the propulsion power of these ships are reaching the point where a marine reactor becomes competitive, bearing in mind the fuel saving which nuclear propulsion affords.

C. RADIOISOTOPES

11. Alongside the applications of nuclear energy for generating power supplies, activity in the extremely varied field of isotope and radiation applications in industry, agriculture, medicine and research has continued to grow, by reason of the mounting interest from various quarters inside and outside the Community.

Isotope techniques are already widely used in the United States, where public funds channelled into development work by the USAEC amount to \$55 million, plus another \$14 million for 1967. The number of Community users of these techniques went up by 15% in 1966 to 10,000. However, this figure has to be set against the number of potential users, which is over half a million.

This shows how the Community has fallen behind in isotope use, a leeway which is also reflected in a marked shortage of skilled personnel. If the possibilities of rationalization afforded by isotope applications are to be fully exploited, every sector of industry must be examined systematically and development programmes drawn up.

As to radiation sources and devices, the Community is still dependent on imports for products calling for advanced fabrication techniques. On the other hand, the state of the industry in Europe has improved, even though it suffers from the fact that the Common Market is still incomplete and from the relatively small account of public resources devoted to this particular sector. In certain cases where circumstances were especially favourable, Community undertakings have attained a leading position. But competition from other industrial nations remains keen in regard to highly specialized products and the Community is, indeed, dependent at times on the efforts of some of its neighbours; these efforts are often focussed all the more on isotope questions as certain of the countries concerned have not yet launched any major programme for developing energy applications.

D. THE FUEL CYCLE

12. While generation of nuclear electricity and other industrial applications doubtless constitute the primary and best-known aspect of atomic energy, fuel cycling and supplies for reactors of all kinds, though of lesser economic significance, are very important from the industrial angle.

Until about two years ago, the set-up (at least in respect of the slightly enriched uranium cycle) was such that the industry enjoyed favourable conditions as to supplies of materials and availability of conversion and processing facilities at arbitrarily fixed prices.

Today, however, the scene is dominated by the advent of private ownership of nuclear fuel in the United States, by free access to the facilities concerned

with the various steps in the fuel cycle and by the imminence of a system of normal commercial bargaining to determine prices and conditions.

These developments help to point up the importance attaching to the industrial aspects of the fuel cycle and the need to look into the overall prospects, bearing in mind that its several phases are closely interconnected.

Throughout the world, the situation raises a series of problems:

- for the operators, who have to decide which forms they prefer for fuel management in their plants (to rely on one supplier for all facilities relating to the cycle, to split up the order for the various services or to set up their own fuel management division);
- for the manufacturers, who have to select their field of business, plan their organization and possible ties with other industries to enable them to satisfy all the operators' requests and to suggest improvements;
- for the authorities, whose job it is to find ways of ensuring the smooth, unimpeded development of nuclear energy.

In 1966, important decisions were taken outside the Community, namely, by American private industry, which is organizing and integrating its potential particularly in the sector covering fuel supply, conversion and reprocessing, and by the UKAEA. The latter, through modification of the Capenhurst enrichment plant and the availability of such large centres as Springfield and Windscale, is in a position to supply fuel not only to British undertakings but also to foreign operators.

Hence the fuel-cycle problem has to be studied as a whole to see how the Community's industry must be organized in the public interest in the face of the growing complexity and magnitude of these problems.

1. *Coordination of nuclear fuel management*

13. The Ninth General Report drew attention to the inherent features of coordinated management based on the free consent of users. Aside from its economic benefits, the effect on dependability of supply and the fuller participation of Community industry in the industrial processes of the cycle, such coordinated management would make it possible to map out a coherent policy and to achieve some harmonization on questions such as the determination of capacities, investments, etc.

The results of theoretical studies, the advantages of coordinated management, and possible ways of putting it into practical application, were discussed with experts from the Community's industry in July 1966.

These advantages apart, coordinated management would be technically and economically indispensable if an enrichment plant were one day to be set up on a scale enabling it to serve the entire Community.

A plant of this kind will need to be able to produce fuels at minimum cost, and this not only implies the drawing up of an optimization programme for the plant itself, but should embrace the management of all fuels needed or available in the Community. This aspect of the matter has been stressed by the UKAEA, which is investigating the problem of better plant and fuel utilization by means of complex operations research studies.

2. *Fuel element fabrication*

14. The year 1966 was one of continued development in this sector of industry, with several new plants or extensions to existing ones completed or announced both for the conversion of uranium hexafluoride into uranium dioxide and for machining. The trend towards fabricating fuel elements within the Community for certain power plants using enriched uranium was intensified in 1966, cases in point being the Chooz, Lingen and Obrigheim plants.

Many Community enterprises can now be said to possess the know-how and the technical experience for fuel element fabrication. Problems still outstanding concern manufacture of canning and fuel rod and element control methods and specifications, but there are no fundamental difficulties in the way of their solution.

Europe's status in the field of technical development and the powerful industrial set-up in certain non-Member States mean that the blast of international competition will be fierce in the coming years. New guarantee clauses are being offered on the market, principally in the United States, which is technically still well ahead in this field. Here, some European suppliers who have concluded licensing contracts or agreements for the exchange of technical information with non-Community manufacturers and can pass on to them some part of their risks are in a privileged position.

3. *Reprocessing of irradiated fuel*

15. Facilities in service or under construction in the Community include the Cap de la Hague and Eurochemic plants, commissioned in 1966, the Eurex installation, to be completed at the end of 1967, and the facility on which a start has been made near Karlsruhe, designed to process 175 kg of slightly enriched uranium a day.

Technologically, industry in the Community is in a position to develop the methods, design the facilities and manufacture the equipment needed. It is

still short on operational experience (except in the case of France) but no major difficulty seems likely.

If aqueous processing should in fact be confirmed as the best method from the industrial and economic angle, the industrial problem of reprocessing, having regard to the size and cost of the operations involved, will have to be resolved at Community level. From what is known of facilities under construction or planned, it will be the mid-seventies before the question of constructing a large-capacity plant arises.

However, should the development of dry processing methods work out satisfactorily, the possibility of smaller-capacity plants becoming competitive with normal-size facilities employing the aqueous process cannot be ruled out.

The decisions that will need to be taken in the period 1970-75 will have to be well thought out if improvised solutions, possibly unsound ones or of dubious profitability, are to be avoided.

4. *Waste processing and disposal*

16. With the rise in installed nuclear capacity, waste processing and disposal will present a major industrial and economic problem in addition to considerations of health and safety.

At present, the radioactive waste produced as a result of the reprocessing of irradiated elements or from reactor operations throughout the world is generally stored on the site.

Storage arrangements are wholly acceptable from the health and safety angle, but the cost and the accumulating stocks could present a big problem in fifteen years or so. Solutions that are satisfactory from the safety standpoint do exist but the cost needs bringing down.

In addition, considerable research has been devoted within the Community and elsewhere to the processing and final disposal of waste, and pilot or semi-industrial-scale facilities have been installed, especially in the United States, to determine the technical and economic conditions for such operations.

I. Preparations for Future Activities and Second Revision of the Second Five- Year Programme

17. In February 1967, the Commission laid before the Council proposals for the steps to be taken, after the second five-year programme expires, to ensure the adoption of an action programme during 1967.

Those proposals took account of technological progress and the attainment of industrial maturity in certain projects. Due regard was also had to the prospects outlined in 1966 in the first target programme, which is tending to speed up.

Lastly, the Commission has been able to draw on nine years' experience of implementation of the Treaty to assess the benefits and drawbacks of the methods employed and modify them so as to increase their efficiency.

The programme proposed by the Commission for a period of five years (subject to revision during the third year) provided for direct action, participation in certain national projects and the establishment of an industrial development fund.

- a) *Direct action* is based on a joint programme financed by all Member States (Article 7) and carried out more particularly by the Joint Research Centre and the Centre for Information and Documentation (CID).

The programme envisaged for the Ispra establishment includes, *inter alia*, in the heavy reactor field, work to back up the ORGEL programme (in particular on the fuel element and channel) using the ESSOR reactor in the field of solid and liquid state physics, the construction of a pulsed-source reactor (SORA), which will be complementary to the Grenoble very-high-flux reactor, and research on the direct conversion of nuclear energy into electricity.

At the European Transuranium Institute, Karlsruhe, it is planned to extend activities devoted to studies on the use of plutonium in fast reactors, plutonium recycling in thermal reactors and work on transplutonic elements.

The same applies to the Central Nuclear Measurements Bureau at Geel, where it is proposed to install a more powerful accelerator, and the Petten establishment, whose programme embraces materials research in connection with high-temperature gas reactors and more intense utilization of the HFR materials-testing reactor.

Other forms of direct action are:

- dissemination of information by the CID: the documentation service, with its semi-automatic retrieval system, has gone ahead and will be developed further until it is fully adapted to the latest electronic computer techniques;
 - health and safety;
 - supply;
 - technical and economic studies;
 - training and instruction, in particular by means of training courses and grants.
- b) *Participation in national projects*, from which it is intended that the entire Community should derive benefit, may consist in financial aid or in the provision of personnel, services, facilities or equipment, or a combination of both.

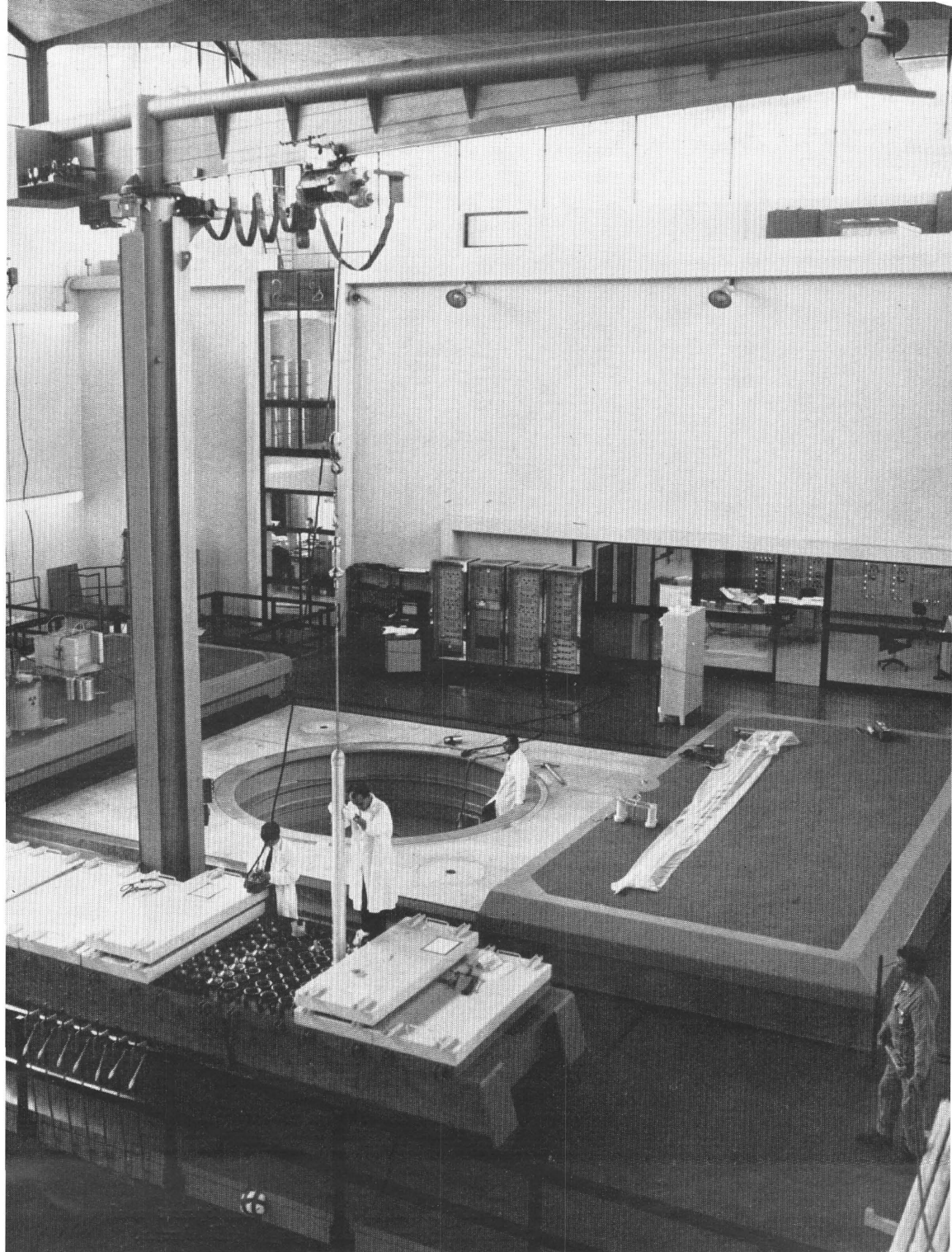
Here the Commission makes a distinction, as regards reactor development more especially, between, on the one hand, "basic" research and development programmes directed towards less immediate uses, lending themselves to wide-scale dissemination of information and generally carried out in publicly-owned research centres, and, on the other hand, the specific development studies preparatory to the construction of industrial plants, which is usually undertaken by industry.

The kind of participation proposed may range from mere continuation of an existing project to utilization of the various opportunities, with all their nuances, provided for in the Treaty.

- c) In addition, the Commission is studying the creation of an industrial development fund to promote certain kinds of industrial activity. It is looking into the problems involved in the construction of prototype power reactors.

18. During 1966 it was found that a second revision of the second five-year programme would be needed so as to provide for the continuance of the fast-reactor programme despite rising costs and certain extensions, and in order to make some unavoidable end-of-programme adjustments in the spread of appropriations among the various establishments and, to a lesser extent, within the separate projects.

In the preliminary draft budget for 1967, submitted to the Council in September, the Commission therefore made a series of provisions directed in



ISPRa (Italy) — VIEW OF THE ECO REACTOR HALL

(See other side of page for caption)

The ECO reactor went critical on 11 December 1965. It is used for development work on the ORGEL Project. The picture shows operators exchanging a fuel element.

the main towards modifying the appropriations for the establishments within the total Joint Research Centre budget, and increasing the amounts earmarked for fast reactors out of estimated surpluses on other projects (the JRC as a whole, ORGEL, etc.) or savings under other heads (e.g., proven-type reactors, reprocessing, waste treatment and radioisotopes).

To this sum of 2.7 million u.a. there are certain carry-overs from the first programme to be added, and possibly also that portion of the reserve designed to meet the difference between the cost of leasing the heavy water for ESSOR and the cost of purchasing it, should leasing prove not feasible.

Other savings are currently contemplated to make good the shortfall in the fast reactor appropriation.

These proposals are under study in the context of the Council's debate on the 1967 research budget.

II. Implementation of the Research Programme

1. Resources and facilities

19. *The Joint Research Centre establishments*

The table on page 34 sets out in summary form the principal data on the four establishments for 1966.

20. At Ispra the physical chemistry and active chemistry laboratories are finished and certain work on the ESSOR complex is all that remains to be done.

The internal equipment of the medium-activity laboratory is taking longer than expected to complete as installation work is still required on some cells.

A further construction programme has been drawn up.

A great deal of general installation work has been carried out, but at a slower pace owing to lack of funds for infrastructure and maintenance.

The EXPO and ECO reactors have operated to the extent permitted by preparations for the start-up of ESSOR.

The ISPRA-1 reactor was used normally, mainly as a neutron source for external assemblies. The KID loop and the CIRO loop (CNEN) were placed in the reactor and brought into operation. The DIRCE loop, reintroduced after the accident in 1965, proved defective and has to be completely overhauled.

Establishment	Staff recruited		<i>Finance (in millions of u.a.)</i>					
			Appropriations used in 1966 (commitments)				Assigned credits ²⁾	Revenue in 1966
	at 31.12.65	at 31.12.66 ¹⁾	Staff and administration (Budget headings I, II, less tax)	Technical operation (Budget Chapters 30, 32, 33 and 34)	Real property investments and maintenance (Budget Chapter 31)	Contract work (Budget Chapter 53 a)		
ISPRA	1553	1663	14.210	2.390	0.796	0.366	3.770	0.598
KARLSRUHE	163	209	1.857	2.046	0.445	2.056	0.025	—
CNMB	157	162	1.856	0.701	0.085	0.043	—	0.006
PETTEN	146	190	1.502	3.365	0.490	0.031	—	0.690
	2019	2224	19.425	8.502	1.816	2.496	3.795	1.294

¹⁾ Including letters of appointment as at 31 December 1966.

²⁾ These are credits stemming from projects under the second programme other than those relating to the Joint Research Centre establishments.

The IBM 360 computer was delivered six months late. In the 360-30 form it has been in operation since delivery and is at present on trial in its 360-65 form. However, ESSOR's needs are such that the IBM 7090 unit has had to be retained in service.

21. From the programme point of view, the Ispra establishment's participation in the ORGEL programme has been primarily in connection with the immediate and future operational requirements of the ESSOR reactor, which went critical satisfactorily on 19 March 1967.

Furthermore, a number of technical specifications and synthesis reports were drawn up prior to issuing the invitation to tender for the ORGEL prototype.

As to other scientific programmes, the draft design for the SORA fast-neutron pulsed-source reactor was completed and the calculations for the critical experiment carried out at Oak Ridge checked. Physics research to be noted include the continued neutron optics experiments, the equipment for which has been enlarged by the installation of a double neutron selector.

In solid state physics, research into radiation-induced defects was continued and a unit for irradiation at the temperature of liquid nitrogen was installed in ISPRA-1.

As part of the ORGEL programme, two new materials were studied — a new dispersed-phase aluminium alloy and a metal-impregnated graphite.

In connection with the fast-reactor associations, the good results obtained on superheated potassium in the boiling state have prompted the preparation of similar experiments with sodium.

Work on the boiling pressurized water and on the injection of hot bodies into the water led on to interesting investigations into the generation and propagation of pressure waves in two-phase systems and into their impact on solid structures.

In the field of direct conversion, two wall/liquid metal combinations for coolant tubes were perfected and a converter constructed under a contract of association with the firm of Brown-Boveri/Krupp was successfully tested in the ISPRA-1 reactor.

As regards automatic data processing, CETIS accomplished a major effort in drawing up programmes and nuclear codes for its new installation and stepped up collaboration with other Community institutions. A system linking the Ispra laboratories with CETIS is being prepared with an eye to possible time-sharing on the new computer. Cooperation with the OECD nuclear code library continued satisfactorily.

22. At Petten, the Commission has focussed greater attention on graphite materials employed for structural and moderating purposes or for coating fuel particles in high-temperature gas-cooled reactors.

Collaboration with the THTR association entered the active phase in 1966; a set of eight reports were forwarded to THTR describing research of common interest in the different fields of graphite research.

The building of a new laboratory for materials testing and the study of mechanical properties opened up the way for investigations into the homogeneity of industrial graphite materials and joint work with the UKAEA was initiated to draw up standards for determining the properties of such substances. Basic studies were also carried out in the graphite research laboratories.

The HFR reactor, operating normally, irradiated a large number of samples on behalf of Member States and its capacity was raised from 20 to 30 MW so as to improve its future irradiation potential.

In capsule fabrication and development, the Petten establishment continued work both for outside customers and for its own account.

23. At the Central Nuclear Measurements Bureau (CNMB) at Geel, the Van de Graaff accelerator and the linear accelerator are functioning extremely well (although some final work still has to be done on the latter). It is desirable that this equipment should be operable from three positions, which is not possible with the staff at present available and in the absence of a decision currently under discussion with Member States to regulate the provision of services.

The CNMB neutron measurements programme went ahead in accordance with the recommendations of the European American Nuclear Data Committee and the Community's committee of experts. The programme aims at meeting the requirements of nuclear physicists and reactor project designers for new or more accurate data.

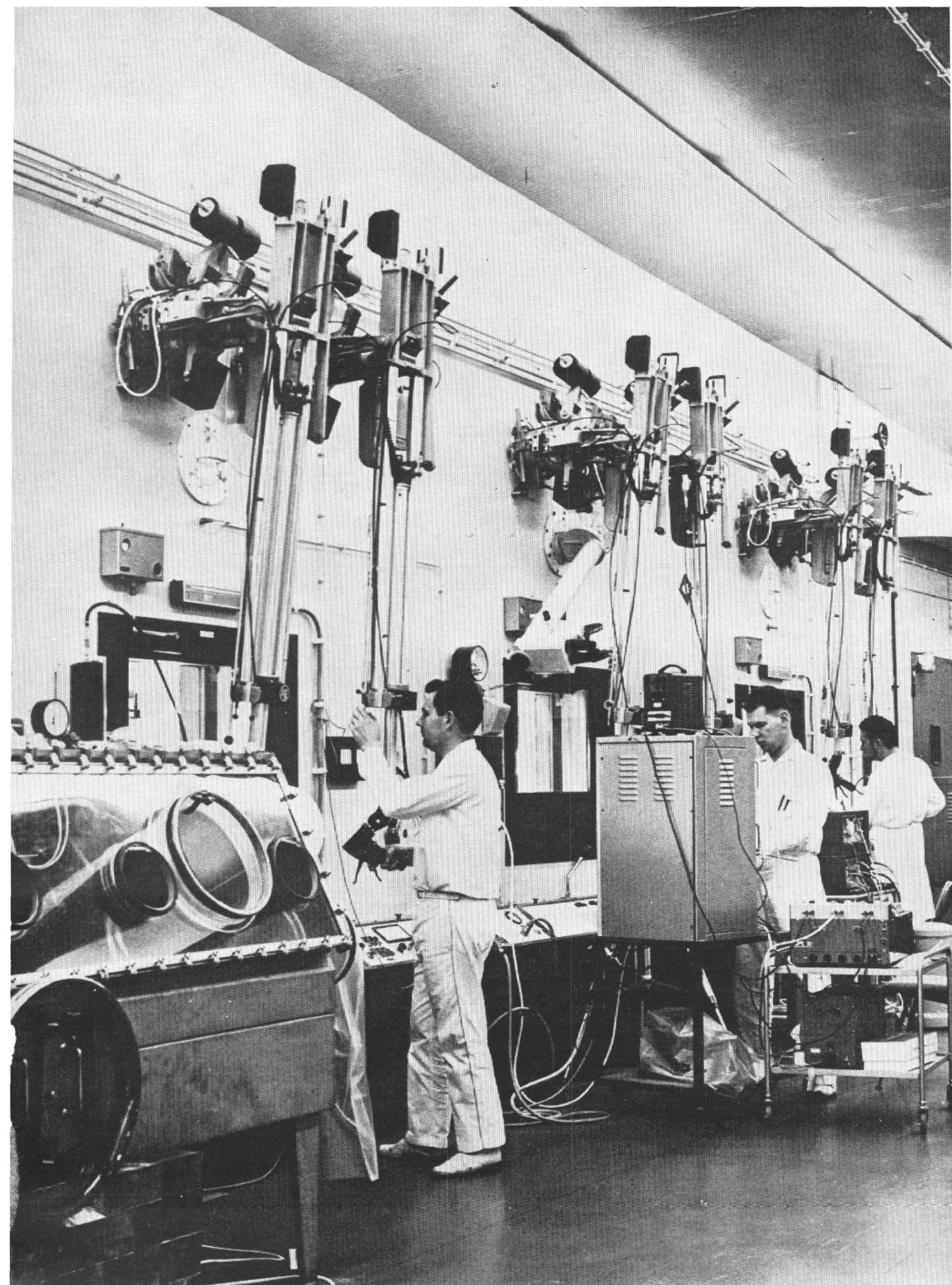
Other work (radionuclide studies, determination of isotopic ratios of stable nuclides, preparation of samples) proceeded normally.

The CNMB's links with external bodies were maintained as regards both laboratories in the Community and other institutions such as the IAEA.

24. The Commission's activities in connection with the plutonium programme at the Transuranium Institute, Karlsruhe, were divided between direct participation, chiefly in fast reactor projects, and work under contract, this year relating mainly to plutonium recycling in light-water reactors.

Noteworthy among activities in the fast reactor field was the fabrication at the Institute of composite fuel assemblies intended for irradiation in the ENRICO FERMI reactor and of elements for the MASURCA critical experiment.

The hot laboratory, which will shortly form one of the Institute's main facilities, is alpha-tight and shielded against gamma radiation and recently went into operation.



KARLSRUHE — INSTITUTE FOR TRANSURANIUM ELEMENTS — B WING.
WORKING ZONE OF HIGH-ACTIVITY CELLS

In the thermal reactor field, the Institute is at present engaged on the development of an inexpensive process for the fabrication of homogeneous plutonium powders suitable for vibratory compacting.

As to the transplutonium programme, processing of irradiated americium in the BR-2 reactor has already begun in the Institute's laboratories.

2. *Contracts*

25. Reduced appropriations as a result of the revision of the second programme and the imminent conclusion of the Euratom/US Joint R and D Programme have meant cutting back certain research contract projects. But the value of work achieved has been underlined by a series of highly successful symposia, some co-sponsored by the IAEA, on aspects of nuclear engineering and on labelled molecules.

3. *Major objectives*

a. *Orgel and heavy-water reactors*

26. The value of a high specific power ORGEL variant and the status of the ORGEL programme, demonstrated back in 1965 to representatives of Community bodies and industries at the Ispra symposium on 26-28 October of that year, caused the Commission to focus its 1966 activities on problems inherent in the construction of a high specific power ORGEL prototype.

The latter's capacity has been raised to 250 MWe to bring it closer into line with the first of an industrial-scale family capable of operating on competitive terms; the decision to do so was based on the fact that the financial loss incurred in operating a prototype reactor is substantially independent of size in the 100-300 MWe range, and also on the greater confidence in the design likely to follow from operation of the WR-1 and ESSOR reactors.

The requisite technical data were collected and the decisions taken by the Belgonucléaire Indatom-Siemens group in 1962 for a 250 MWe power plant were revised in the light of subsequent design studies and findings.

Proceeding on this basis, the Commission drew up notices inviting proposals for detailed draft designs accompanied by firm offers for the construction of such a prototype ORGEL reactor by Community industries. The invitation to tender was published in the "Journal Officiel".

Euratom simultaneously pursued negotiations at Council level to examine the possibilities of a Euratom/US agreement in the heavy-water reactor field. However, the American authorities have recently decided not to proceed with

their programme which is centred on the heavy-water organic-liquid development series.

1966 also saw the on-site fabrication and assembly of the greater part of the mechanical installations and controls for ESSOR. The reactor, which was originally scheduled to go critical in April 1967, first reached criticality on 19 March 1967.

27. Under heavy-water reactor research, special mention should be made of the CIRENE programme for the development of a heavy-water-moderated reactor using fog (steam/water mixtures) as a coolant. This programme, sponsored by CNEN and Euratom, is being carried out by CISE (Centro Italiano Studi Esperienze). The Euratom contribution towards financing the work was recently increased in the face of rising costs since the contract was signed.

During the year, considerable activity was directed to further development studies for a high-capacity reference power plant and to preparing a draft design for a prototype reactor of significant capacity. Particular attention was devoted to the latter at the request of the CNEN, culminating in the decision by CNEN and ENEL in February 1967 to build a CIRENE prototype on the Latina power plant site.

b. *High-temperature gas reactors*

28. The high-temperature gas series enjoyed considerable success in the year under review. Euratom's activity in this field consists firstly in participation, along with the European Nuclear Energy Agency, in the DRAGON project and secondly in an association with Brown-Boveri/Krupp and the Kernforschungsanlage Jülich des Landes Nordrhein-Westfalen (KFA) for the development of a pebble-bed reactor using thorium.

DRAGON programme

29. The DRAGON reactor was run up to full power in April 1966 and has since operated for several months at a helium temperature of 830°C at the core outlet. The performance of the fuel elements and mechanical components is remarkably good and contamination of the primary circuit has remained below the limits set. There has, however, been corrosion of the exchangers by the lithium-treated water employed for safety reasons peculiar to DRAGON. The reactor had to be shut down for a time in order to eliminate leakages.

Early in January 1967, the reactor was started up at full power with the second core, and initial data on the latter's performance are highly satisfactory. The total activity in the primary circuit is in the neighbourhood of 200 milli-

curies — a very low figure seeing that the second core is largely composed of non-vented fuel.

However, renewal of the DRAGON agreement until April 1970 to enable expenditure on this development series to be recouped is still being held up while the Council of Ministers discusses the matter.

THTR programme

30. Development of a pebble-bed reactor using thorium is covered by a Euratom contract of association between the Community and KFA and Brown-Boveri/Krupp, signed in 1964, indirect financial backing being provided by the Federal Ministry of Scientific Research. The object of this association was described in the Ninth General Report.

Delivery of the first US-made fuel elements for the AVR reactor began in 1966 and criticality using air was reached in August 1966.

General specifications for make-up fuel for fabrication in the Community were drawn up and a call for bids issued.

Design studies being actively pursued in the realm of reactor physics and technology relate especially to the loading/unloading circuit and to the reactor vessel, heat exchangers, blowers and reactor chemistry.

3. Fast neutron reactors

31. In 1966, as in the preceding year, good progress in design studies and research and in the construction of large-scale installations was accompanied by serious organizational and financial problems.

The upward trend in research programme costs which occurred after the Council's mid-1965 decision concerning the revision of the second five-year programme, and which was due to the general rise in prices, underestimates of certain construction costs and speeding-up of the work, confronted the Commission with problems which at the turn of the year were still unsolved. In particular, it was not possible to reach a decision in 1966 on a fresh proposal which the Commission laid before the Council for revision of the second programme. Moreover, negotiations with certain parties failed to produce formal decisions to renew contracts or raise ceilings as the Commission had hoped.

Thus the contract of association with the CNEN which expired on 30 June 1966 could not be extended before the expiry date despite the availability of funds for the activity in question. The CNEN's proposed programme for continuing the association included a start on a fast fuel-testing reactor (PEC)

and this, in the opinion of the Commission — which otherwise took a favourable view of the Italian proposals — required the Council's consent to a modification of the second programme.

While the ceiling for the contract of association with the GfK, running until the end of 1967, was raised to cover requirements until the end of 1966, the same could not be done in respect of the association with the CEA, which in October 1966 topped the ceiling contracted for, as negotiations were interrupted pending settlement at Council level of the problem of financing the plutonium for use in the MASURCA critical assembly. The contract with the CEA was allowed to lapse at the end of 1966 without any formal negotiations having been initiated for its extension into 1967; nevertheless, research by the joint team and the pooling of information have not been affected by these difficulties.

The Commission regards continuity in this particular contract as highly desirable and is doing everything to secure satisfactory solutions at Community level.

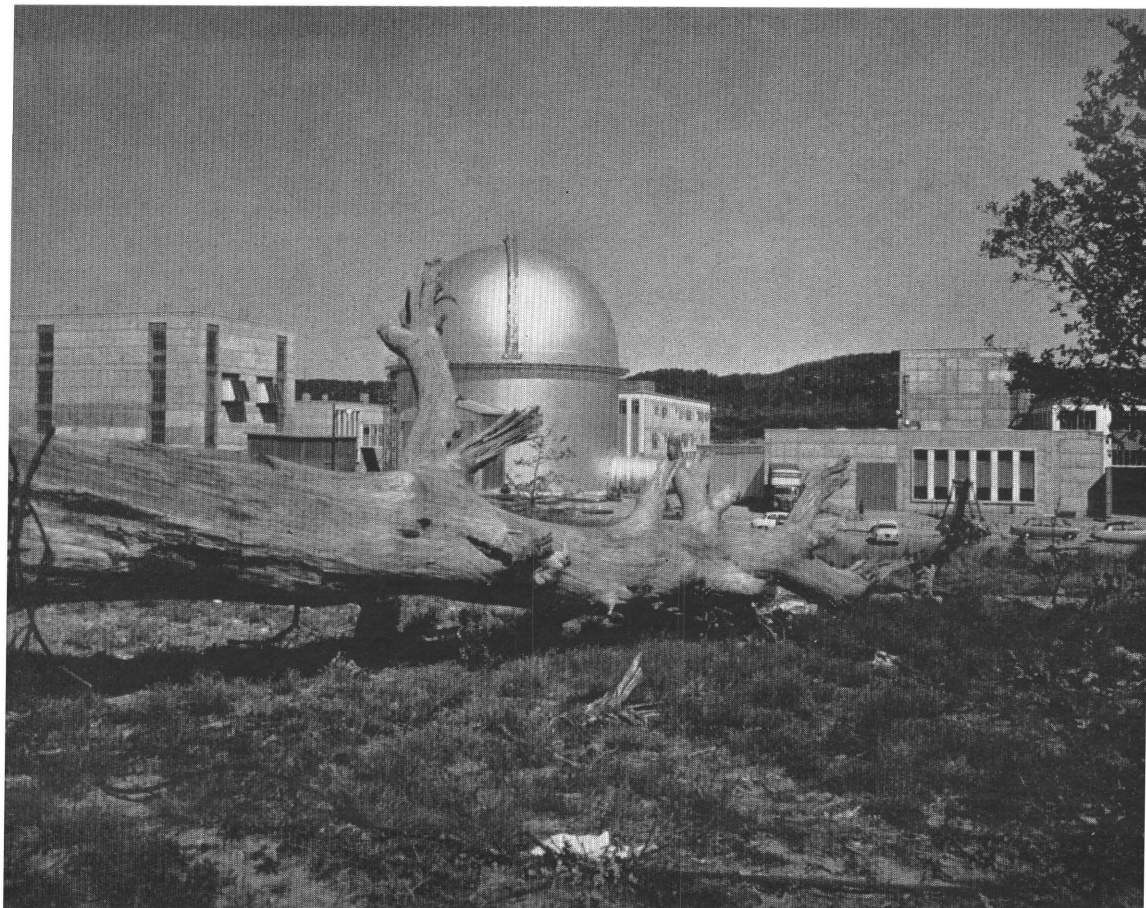
The HARMONIE source reactor went into routine operation early in 1966 and has since been in permanent use. The STARK and SUAK assemblies were in regular service at Karlsruhe until the autumn of 1966, when they had to be unloaded to meet enriched uranium requirements for SNEAK.

Construction of the SNEAK and MASURCA critical assemblies was completed and both reached criticality on the same date (15 November 1966). MASURCA went critical with a core consisting for the major part of plutonium rodlets made at the European Transuranium Institute, and SNEAK with an enriched uranium core pending completion of fabrication of its plutonium elements.

Construction of RAPSODIE was to all intents and purposes finished by the autumn of 1966 and the closing months of the year were spent in trials preliminary to start-up; the reactor went critical on 28 January 1967, a few minor incidents which occurred in 1966 having had no appreciable delaying effect.

In the United States, construction of the SEFOR reactor (with Euratom participation through its associate GfK) is about six months behind schedule owing to general difficulties in the procurement of certain equipment.

The associations with, on the one hand, CEA and, on the other, GfK, the Belgian Gouvernement and the TNO and RCN groups have very actively pursued their fast reactor studies. The Community's prominent position in this field and the respect accorded to its achievement received fresh confirmation at the Symposium on Fast Reactors held by the British Nuclear Energy Society in May 1966. The work at Cadarache has made it possible to determine the broad lines of a sodium fast reactor with a power of about 250 MWe (PHENIX), the detailed draft design for which will be ready at the end of 1967. Work



CADARACHE (France) — RAPSODIE REACTOR

(See other side of page for caption)

RAPSODIE (RAPide SODium — fast sodium) is a fast neutron reactor cooled with liquid sodium and fuelled with plutonium. It will produce a total thermal power of 20 MW.

at Karlsruhe resulted in two draft designs for 1000 MWe reactors using sodium and dry steam as coolant from which preliminary draft designs for 250-300 MWe power prototypes will be drawn up during the first half of 1967.

4. *Proven-type reactors*

32. Pursuing its development programme in the field of gas reactors by way of contracts, Euratom concentrated on solving a limited number of problems so as to derive maximum benefit from expenditure incurred and working towards solution of the main difficulties which lie ahead in the development of this type of reactor.

Fuel element development, heat transfer, structural materials and reactor technology are among the subjects being studied. As regards reactors physics, ENEL has an important programme in hand at Latina for measuring changes in reactivity as a function of burn-up experimentally and comparing the values with theoretical calculations.

New activities initiated by the Commission in support of this development work fall mainly under the headings of the Euratom/US Joint Programme, its own programme and the holding of seminars.

As far as European variants of light-water reactors are concerned, a milestone in the development of Vortex fuel was reached when a prototype assembly was incorporated in the Kahl reactor.

Regarding power reactor experiments, the experimental programme on the Garigliano power plant planned for 1966 was successfully carried out. As against that, the Commission's development efforts on nuclear fuel and materials, begun in previous years, have been held up owing to reduced appropriations.

As to plutonium recycling, various research projects under contracts entered into with the CEN/Belgonucléaire association and the CEA have gone forward, and the Commission has awarded ENEL a contract for an important study for the ENRICO FERMI and Garigliano power plants.

Lastly, research into structural materials has yielded substantial advances on two major problems, one concerned with the build-up welding or plating of reactor vessels and the other with brittle fracture of steel vessels.

5. *Materials-testing reactors*

33. The HFR reactor at the Petten JRC establishment and the Mol BR-2 reactor, which is run in association with Euratom, have been in regular service, making an important contribution to the irradiation programmes of Member States and of the Commission.

The capacity of the Petten reactor, now increased from 20 to 30 MWth, has been very satisfactorily employed, mainly on work for the Reactor Centrum Nederland and the French CEA.

A wider range of Community customers for the irradiation facilities offered by the Mol reactor is progressively displacing in importance the demand from non-Member States, which now accounts for only a small proportion.

A number of new irradiation techniques have been developed to make reactor utilization more flexible and to improve the reproducibility and accuracy of irradiation experiments.

6. *Thermonuclear reactions*

34. The Commission's activity in the field of plasma physics and fusion went ahead under the five associations (with CEA, CNEN, IPP, FOM and KFA) set up several years back. Collaboration continues to encounter no major difficulties.

The "Interassociations" liaison group held an important meeting at Garching in October 1966, the main purpose of which was joint consideration of the long-range programmes of all the Community's laboratories, with due regard to the present state of affairs and the way it is likely to evolve and to similar programmes outside the Community, notably in the US. The findings of the liaison group were that the position of the Community in this field may be described as satisfactory both from the programme angle and in the matter of organization and material resources, and that a relatively small increase in staff and budget appropriations should be enough to maintain the Community's position for the next few years. The programmes of the various associations take account of the need to avoid overlapping and provision has been made for extensive collaboration between laboratories on a number of items. The liaison group recommended that the Commission's activity should continue in its present form and pointed out the negative effect which any slackening of Euratom's endeavours in this field would have on Community programmes as a whole. There was a consensus on the value of closer cooperation with universities.

Several of the associated laboratories were concerned in plasma production by means of very powerful lasers. A working party on the subject was set up in 1966; another, on cooperation in the field of plasma physics technology and instrumentation, is in the process of formation.

The fundamental scientific problem is still that of stable confinement; here the trend towards closed configurations mentioned in the Ninth Report was still in evidence.

In this connection, activity was stepped up at several laboratories, in particular at Garching, Fontenay-aux-Roses and Jutphaas. Greater interest is being displayed in relatively cold plasmas, which are simpler and cheaper to produce

and control, for use in the study of a great many physical phenomena. An international conference on the subject at Frascati, organized by the Euratom/CNEN association, provided a forum for highly useful discussion between experts.

Research on hot, dense plasma formation by azimuth pinch was continued, notably at Garching (IPP) and Jülich (KFA).

At Frascati (CNEN), a new experiment has begun for producing very dense, hot plasmas by means of an extremely high magnetic field.

The Saclay laboratory (CEA) is still specializing in plasma production, confinement and acceleration by means of stationary magnetic fields in combination with very high frequency electromagnetic fields.

Lastly, the scale of work in the realm of controlled fusion in Europe has been such as to warrant the institution of a periodic conference. The First European Conference on Controlled Fusion and Plasma Physics was arranged by the Garching Institute and was held in October 1966 in Munich.

7. Low-energy nuclear phenomena

35. The contract of association with CNEN/INFN for low-energy nuclear physics research was extended for one year (i.e., until December 1967) with no increase in the Commission's financial contribution.

Scientific work generally has continued on the lines of previous years and tends to be concentrated in centres equipped with accelerators and reactors. Noteworthy among recent results are isobar resonance analysis, polarization measurement of neutrons and protons produced by elastic and inelastic collision, and the study of fluctuations in collision cross-sections.

Particular attention has been paid to photon reaction research. Numerous calculations of cross-sections for neutrons of different energies were performed, several of them in accordance with EANDC suggestions.

Fission phenomena induced by particles or photons have been studied over a wide energy range.

Cooperation with the JRC, and especially with CNMB, was stepped up.

8. Biology

36. The year 1965 was one of consolidation. On the whole, 1966 followed the same trend, the foundations of the programme having been laid in preceding years. Thus the efficiency of existing arrangements had to be bolstered up to the utmost extent by the creation of an ever-widening network of coordinated

action. The cardinal aim is to step up the flow of information to the applied portions of the programme and to unite all parties to contracts with the Commission into a veritable community of radiobiological science. To the extent that these objectives have been achieved, the potentialities of each separate laboratory have risen along with their combined productivity.

The broad lines of the biology programme will continue to be followed, with studies on

- the toxic effects of radioisotopes,
- treatment of irradiation cases,
- radioactive contamination of the environment and the food chain.

Furthermore, in view of the importance attaching to neutron dosimetry problems, the Commission quite recently entered into a new contract directed at measuring neutron doses in different organs as a function of their composition.

It will be recalled that the biology group at the Ispra establishment, alongside its work in the field of environmental contamination, has been contributing to the study of such problems as the effects on man of the handling or injection of substances used in reactor technology, the metabolism of terphenyls, etc.

9. *Labelled molecules and radioisotopes*

37. The programme in the labelled molecules field as set out in last year's report was continued by way of the labelled molecules bank and research under contract.

The labelled molecules bank delivered preparations unobtainable on the market to Community States and other countries, thus enabling research to be conducted which would have been impossible without its help.

At the same time, research projects were carried out under contracts with university bodies or industrial concerns in the Community for the preparation of new labelled substances, for perfecting new methods of synthesis or for improving the techniques employed so as to yield higher-quality products at lower cost. Concomitant with this activity was the organization of meetings of scientific experts and of exchanges of information with bodies in non-Member States.

Owing to financial restrictions, the Commission's activities in the field of radioisotopes were reduced to administering unexpired contracts. These contracts cover work connected with the production of new radioisotopes (for obtaining a high-activity Cl-36, short-lived radioisotope generators, etc.) and the development of new techniques. In this latter sector collaboration with the BR-2 operating group and the direct conversion group at Ispra is continuing smoothly.

10. *Training and instruction*

38. Budget restrictions curtailed training and instruction work in 1966 as compared with 1965, appropriations being down from 500,000 to 325,000 u.a. as a result of the cut in the programme from three to two million u.a. when it was revamped.

The difficulties mentioned in the Ninth Report persisted, and appropriations earmarked for 1967 will be of the same order as for 1966. Consequently, reductions had to be made in the number and duration of training grants and awards. Although the Commission gave no publicity to these grants and awards, many promising applications had to be turned down.

In 1966 the Commission financed 96 new student-training courses in Joint Research Centre establishments and other establishments in Community countries, including nuclear power plants linked to Euratom by participation contracts (the 1965 figure was 271).

During the year under review, new thesis grants or specialization grants for young teachers numbered 16 as against 31 in 1965.

Doctorate theses written under Euratom awards were submitted to various universities for the first time in 1966, confirming the value of these specialization grants. Former grant-holders have been taken on as specialists by national research centres, nuclear industry or the Commission.

During the year Euratom sponsored a symposium for its grant-holders at which interesting exchanges of information took place.

In 1966 the Commission was host to six qualified trainees, that is to say engineering and science graduates already possessing some practical experience in their specialist line. These trainees were given opportunities to familiarize themselves with the work undertaken by the Community, which for its part was able to draw on their previous experience to the benefit of its scientific and technical activity.

In implementation of an agreement signed with a number of laboratories in the Community on the interdisciplinary training of young research workers, courses in molecular biology and radiobiology were arranged and were attended by 34 young scientists. Under the terms of the same agreement, 12 others received interdisciplinary training grants in those same fields.

The Commission continues to promote the training of its own scientific and technical personnel by holding courses and encouraging its research staff to take part in scientific gatherings. A programme for the training of reactor operators has been started with the commissioning of the ESSOR reactor in mind.

Activity directed towards standardizing nuclear instruction at the technical level continued. The "Reactor Operation" programme was published. The

Commission placed before the Council a proposal aimed at perfecting, by agreement with national authorities and the Commission, a procedure for ensuring *inter alia* that instruction given in establishments which have adopted the standard curricula does in fact conform to them.

11. *Results*

39. During 1966, the Commission and its partners in contracts or associations produced and published between them 502 scientific and technical reports and a total of 589 papers issued or read at conferences.

A total of 1019 patent applications were filed (51 of them being first applications in the name of Euratom) and 241 patents for invention were granted.

Revenue amounted to 1,294,000 u.a., chiefly from services rendered (irradiations at Petten, computer work at Ispra and services offered by the CNMB).

I. Nuclear Power Plants and Marine Propulsion

1. *Euratom/US Agreement Programme*

40. The three nuclear power plants built under the power reactor programme embodied in the Euratom/US Agreement for Cooperation are now in service or on the point of commissioning.

During the year under review, the Garigliano boiling-water plant (150 MWe) ran very well, the load factor averaging 86.8% for the period 1 May to 31 December 1966.

A measurements programme using four instrumented fuel assemblies and a data logger yielded very interesting results, demonstrating among other things the good stability of the reactor when operating with a very high void coefficient in the core (around 50%) and the possibility of substantially increasing the power which can be extracted from the core.

Experience with the data logger showed what a valuable instrument it is for optimizing operation of a boiling-water power reactor.

After an experimental period devoted to the systematic checking of equipment and core performance, the Gundremmingen power plant attained its net rated power of 237 MWe at the end of 1966 and has since been operating very satisfactorily. This is the first of the generation of direct-cycle boiling-water reactors in which the steam separators are housed inside the actual pressure vessel.

Lastly, the SENA pressurized-water power plant is all but finished. After a period in which the various parts are tested for trouble-free operation, it will gradually be run up to full-power (266 MWe). The elaborate core instrumentation will enable a large number of nuclear parameters to be measured while the reactor is in operation. These will be a great help not only in the optimization of operational criteria for the Chooz power plant but also in studies for improving the performance of pressurized-water reactors in general.

2. Power reactor participation programme

41. The programme of participation designed to promote industrial activity was included in the first five-year programme with the object of:

- encouraging Community enterprises in the construction of nuclear power plants and demonstrating their industrial and commercial possibilities;
- creating conditions designed to promote far-reaching participation in the construction of nuclear power plants and the manufacture of equipment therefor by Community industry, to enable it to open up the way for the construction of nuclear power plants at competitive prices;
- establishing a system for disseminating the experience and data acquired in the course of nuclear power plant construction and operation, for the benefit of Community constructors and operators.

To that end the Commission signed five contracts of participation relating to five nuclear power plants, some figures for which are given below.

Contractor	Power plant	Type	Net electric output (MW)	Expires/renewed contract expires ¹⁾	Participation ceiling (u.a.)
ENEL	Garigliano	BWR	150	31.12.67/31.12.69	7,000,000
ENEL	Latina	GGR	200	31.12.67/31.12.69	4,000,000
SENA	Chooz	PWR	266	31.12.69/31.12.71	8,000,000
KRB	Gundremmingen	BWR	237	31.12.70/31.12.72	8,000,000
GKN	Dodewaard	BWR	50	31.3.72 extension by mutual agreement	5,000,000
				Total	32,000,000

¹⁾ In each case, the first date is the expiry date of the relevant contract of participation and the second is the expiry date after renewal as provided for in the contracts of participation if requested by the contractor.

By virtue of these contracts, Euratom assumes part of:

- the charges incurred by the contractor as a result of a discrepancy between the energy produced by the plant and the output from a comparable conventional plant during the start-up period;
- the fabrication costs of certain reactor components in so far as these are made in the Community by Community enterprises.

42. Below is a breakdown of participation and repayments up to the end of 1966.

Contractor and plant	Start-up (u.a.)		Fuel (u.a.)		Nuclear and para-nuclear parts (u.a.)	
	Participation	Repayments as at end 1966	Participation	Repayments as at end 1966	Participation	Repayments as at end 1966
ENEL/Garigliano	3,000,000	3,000,000	4,000,000		—	—
ENEL/Latina	—	—	4,000,000		—	—
SENA/Chooz	2,000,000		6,000,000	1,050,000 ¹⁾	—	—
KRB/Gundremmingen	—	—	200,000		7,800,000 ²⁾	7,800,000
GKN/Dodewaard	400,000		1,300,000		3,300,000	1,100,000

1) Repayment of part of this sum had been authorized but not yet effected at the end of 1966.

2) KRB undertakes to repay Euratom the sum of 2,000,000 u.a. if during the term of the contract of participation the Company is unable to order in the Community fuel elements to an equivalent value (or will repay the difference between the said sum and the amounts of such orders).

In return for its participation, Euratom receives a considerable volume of information relating to the design, construction, commissioning and operation of the five nuclear power plants, which it makes available to all parties furnishing evidence of legitimate interest.

Access to the information is provided through various channels: documentation supplied by the contractors, secondment of staff of Euratom or of certain Community bodies and enterprises to work on the project, and student training courses.

The information is disseminated by means of technical seminars, reports, printed publications and microfilms. There are also facilities for consulting the documentation available at Euratom headquarters.

43. The programme of participation is a relatively long-term undertaking, covering a period of over ten years. After five years' experience, it can be said to have proved its worth.

The opportunities opened up by contracts of participation were, indeed, major factors governing the decision to build industrial-scale nuclear power plants in several of the Community countries. These projects are helping the operators to gain worth-while nuclear experience, which extends, in the Community countries, to the three development series now known as proven-type reactors.

Moreover, since the contracts of participation stipulate that fuel element fabrication and the manufacture of certain nuclear and paranuclear components should be performed by Community enterprises, not only has Community industry carried out the civil engineering, the manufacture of the conventional parts and nearly all the assembly and erection work, but it has also taken a very large part in the fabrication of the nuclear and paranuclear equipment required for the power plants in question. This adds up to some ten million man/days on site and in the shop for the five projects together.

Fuel element fabrication deserves special mention. In the case of two out of the five projects it was decided at the outset that the fuel elements (standby and reload elements for SENA and first-core elements for GKN) should be made by enterprises in the Community, and the same will very probably apply in respect of the other three (standby and reload for KRB, reload for the two ENEL power plants).

To sum up, all five installations have given Community industry direct practical experience in industrial nuclear plant construction and an opportunity of collecting first-hand data by way of seminars, technical reports and above all the secondment of personnel.

In 1966, alongside the information system introduced under the programme of participation, the Commission initiated the systematic pooling (independently of contractual ties) of experience acquired as a result of incidents occurring during the construction and operation of nuclear power plants located in Member States.

44. A brief outline of the position in 1966 of the five power plants in which Euratom participates is given below.

The Garigliano plant operated normally for the last eight months of the year, delivering around 750 million kWh to the national grid. During the first four months of the year, the repairs and other work begun in October were completed. Six fuel elements were replaced, four by instrumented elements under a Euratom research contract and two by ordinary elements. ENEL has asked for the contract of participation to be extended.

The Latina power plant also operated normally throughout the year and delivered some 1,350,000,00 kWh to the grid. Annual maintenance was carried out without shutting down the plant, which was maintained at about two-thirds capacity for 45 days. There was a month's outage following a

transient rise in the fuel temperature when the reactor was started up again. Batches of irradiated fuel elements continued to be sent to the Windscale reprocessing plant. Renewal of the contract of participation has been requested by ENEL.

Construction work on the Chooz power plant was finished. Owing to various teething troubles, the schedule of trials prior to the power run-up could not be completed before the end of the year. Full-scale commissioning should take place in or around April or May 1967.

At Gundremmingen, construction work was terminated in the autumn of 1966 and most of the trials were completed before the year's end. The reactor went critical on 14 August 1966 and reached full power for the first time on 23 December 1966. By the end of the year it had supplied about 90 million kWh to the grid.

Civil engineering work went ahead on schedule at the Dodewaard power plant site. Some delay occurred in assembly jobs connected with the installation of the reactor vessel and the tanks for the pressure-equalization system, owing to difficulties encountered during their fabrication. As this leeway can to a large extent be made up, criticality is scheduled for January 1968.

3. *Joint Enterprises*

45. In previous years, the Council had conferred joint enterprise status on three undertakings, namely, SENA (Chooz power plant) in 1961, KRB (Gundremmingen power plant) in 1963 and KWL (Lingen power plant) in 1964.

In July 1966 a fourth undertaking, the Kernkraftwerk Obrigheim GmbH (KWO), was made a joint enterprise as a result of an application which it had submitted to the Commission at the beginning of 1965. The Commission referred the application, supported by a concurring opinion, to the Council in November 1965. On the basis of the legal status of a joint enterprise, the Obrigheim company was granted, in conformity with Article 48 of and Annex III to the Euratom Treaty, fiscal benefits through which the taxes payable in connection with the operation of the power plant are reduced, according to its own estimates, by five to eight million u.a.

Euratom's reasons for creating a fourth joint enterprise were similar to those which applied in the three earlier cases. Specifically, without assistance from the public sector, KWO's associates would not have decided to build the nuclear power plant in question since it was not capable of generating electricity at the same price as conventional thermal power plants. But even if such installations are not yet competitive, the Community cannot afford not to build nuclear plants if it wants to increase its knowledge and output capacity and thus become fully competitive on the international market.

The technical know-how obtained from construction of the Obrigheim nuclear power plant is available to Community industry as a whole. The joint enterprise will submit written reports on the technical and economic experience acquired and it will be possible for Euratom staff and for engineers from nuclear undertakings to take an active part in construction work or to be present as observers.

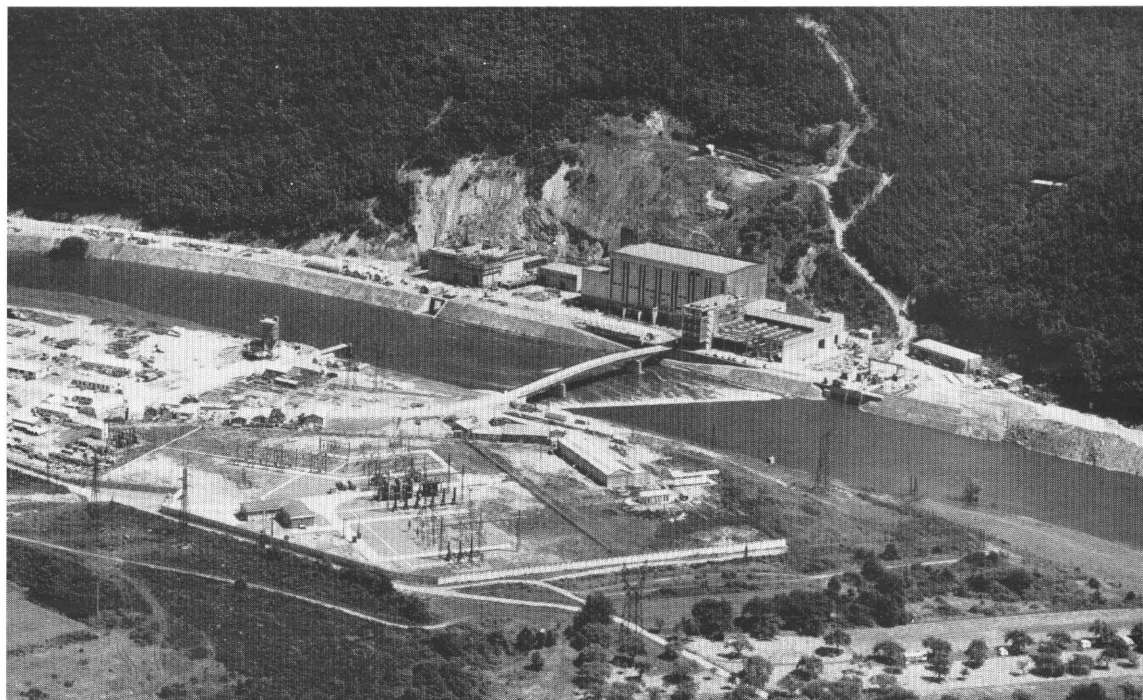
The KWO concern comprises 13 medium and small-scale electricity suppliers in the Land of Baden-Württemberg who have joined forces to set up the Obrigheim nuclear power plant and will receive the energy generated. The plant is designed for a capacity of 300 MWe and equipped with a pressurized-water reactor. Siemens is the principal supplier but many other firms in the Community are assisting in the project as subcontractors, no less than 95% of the services required for the construction of the power plant being provided by Community industry. Only to a very small extent will licences from non-Community countries be utilized.

46. Under Article 50 of the Euratom Treaty, joint enterprises cannot alter their Articles of Association save with the consent of the Council. Hence the amendments to the Articles of the four joint enterprises — SENA, KRB, KWL and KWO — needed to be approved by the Council acting on a proposal of the Commission. They related mainly to capital increases.

The main reason for granting joint enterprise status as provided in Chapter V of the Treaty of the four enterprises in the years 1962 to 1966 was the need to provide financial backing for their projects and to iron out the handicaps under which they would have laboured as regards competition. As nuclear power plants with first-generation reactors have meanwhile become competitive, the major argument for conferring joint enterprise status on such plants will no longer be concerned with this particular aspect.

Even so, the Commission is of the opinion that it will still be desirable and often necessary for undertakings contemplating the construction and operation of prototype nuclear power plants using advanced-type reactors to enjoy joint enterprise status and the advantages attaching to it. The same applies in the case of Community-scale enterprises which must form the essential infrastructure for nuclear energy production and in that of large power plants which will supply nuclear energy to two or more Community countries. A condensed outline of the position in the SENA and KRB undertakings with which the Commission has contracts of participation is given under sub-heading 2 above. The following is a brief account of the situation with regard to KWL and KWO.

The Lingen power plant is equipped with a boiling-water oil-superheat reactor. Its net generating capacity totals 240 MWe, of which 160 MWe is of nuclear origin. Construction started in October 1964. By the end of 1966



CHOOZ (France) — FRANCO-BELGIAN NUCLEAR POWER PLANT

(See other side of page for caption)

The Chooz plant, which is fitted with a pressurized water reactor, has just been completed. After tests have been carried out to ensure the correct functioning of the various components, it will gradually be run up to its full-power operating output of 266 MWe.

a large part of the civil engineering work had been finished as well as some important features such as the construction and pressure testing of the containment shell and the installation of the reactor vessel. The fuel elements have been ordered from a German concern. The power plant is due to be commissioned in September 1968.

As regards the Obrigheim power plant, on-site construction work began in March 1965. During 1966, the rough work for most of the buildings was completed, construction of the containment shell was finished and pressure tests were successfully carried out towards the end of the year. Delivery and installation of the reactor vessel, steam generators, pressurizer and turbo-alternator unit are scheduled for early 1967. Orders for the fuel elements and control rods have been placed with Community firms. The planned date of commissioning is October 1968.

4. *Nuclear ship propulsion*

47. Through its participation in the construction of the nuclear research ship "Otto Hahn" by the Gesellschaft für Kernenergieverwertung in Schiffbau und Schifffahrt mbH (GKSS) Euratom was able to continue the dissemination of new data acquired in the course of fabrication of the nuclear parts and their installation in the ship. New fabrication methods proved necessary, causing delays of a few months — as is to be expected when a prototype is being built.

Some components made by non-German suppliers were delivered in 1966. The collaboration of European concerns as stipulated in the contract of participation with the Commission presented certain difficulties which ought to be avoided in future by the standardization of administrative regulations, especially on safety matters (see reply to Mr. Aigner's written question No. 109).

In research and development, the contracts of association signed by the Commission in 1961 with the Reactor Centrum Nederland, with the Italian Fiat and Ansaldo companies and also with GKSS are due to expire at the end of 1967. Judging from 1966 results, these contracts will have fulfilled their purpose by the time they run out and a contribution will thus have been made towards gearing the nuclear and ship-building industries to meet future requirements. On the other hand, the research involved, being on more general lines — optimization of radiation-shielding, increasing the mechanical strength of the installation and improving the naval architecture of nuclear ships — and the design studies and experiments could profitably be extended in the coming years even though the knowledge so far acquired is quite satisfactory and can be used for any marine reactor design.

II. Industrial Applications of Radioisotopes and Radiations

48. With a view to fostering industrial applications of radioisotopes and radiations, the Commission pursued its task of coordination, promotion and information through the Bureau Eurisotop.

Since techniques using isotopes have numerous practical applications in many sectors of industry, the area of promotional activity has to be carefully selected and delimited as isotope and industrial technology progresses. To that end, the Commission redoubled its efforts in 1966 to contact a large number of laboratories, firms and industrial or national agencies with an eye to the rational dovetailing of Euratom's activities in the various Member States' programmes.

Its promotional activities have had a bearing on many branches of industry. Two examples are considered here, namely, metallurgy and textiles.

49. The conditions obtaining in the steel industry — the high temperatures involved and large quantities of materials employed — frequently call for special measuring and control methods. Nuclear techniques have proved readily adaptable to these demands. The Commission has accordingly, in cooperation with the High Authority of the Coal and Steel Community, sought to foster radioisotope applications in this field.

A case in point is the determination of oxygen in steel by means of activation analysis, developed in conjunction with numerous specialist laboratories throughout the world. In the same connection, an activation analysis unit for oxygen assay has been installed, under the joint aegis of the ECSC High Authority and national metallurgical research bodies, on the floors of converters in a steel foundry.

The second of these devices will provide opportunities for demonstrating the advantages of activation analysis on an industrial scale and acquiring the know-how for extending the method to other steel foundries in the Community.

At the same time, development and research contracts with university laboratories and private undertakings have led to the perfecting of compact, automatic activation analysis units, the study of technical and economic aspects of activable tracer applications in industry, and the realistic assessment of these technical developments.

50. The textile industry was another important field in which Euratom mobilized Community cooperation to encourage the use of radioisotopes and radiations. With the advice of a management committee composed of leaders of textile groups and eminent nuclear experts, the Bureau Eurisotop arranged some 600 study visits by 40 nuclear experts to nearly 325 textile enterprises.

A hundred or so practical applications of radioisotopes and radiations devised in the course of this work will be laid before textile concerns at two public conferences. The textile industry is also beginning to display a growing interest in nuclear techniques and to initiate nuclear research itself. In addition, numbers of contacts and information exchanges between specialists in nuclear techniques and on the textiles side have brought the respective disciplines closer together. This augurs well for the future.

A third form of Community action based on the irradiation technique is concerned with chemicals, pharmaceuticals, foodstuffs, wood/plastic combinations, medical equipment, animal feeding stuffs and packaging.

A 175,000 Curie caesium-137 mobile irradiation unit will tour industrial areas of the Community countries and irradiate all kinds of materials and substances free of charge. The significant point is the polyvalent nature of this activity, which opens up the way for the introduction of new manufacturing and processing methods for a wide range of industrial products through the promotion of a nuclear technique.

The Commission has backed these and other activities by the large-scale dissemination of technical and economic documentation — memoranda and background notes, Bureau Eurisotop news and working papers — to ensure that the information reaches all interested quarters promptly.

III. Legal and Institutional Infrastructure

1. *Implementation of Articles 41-44 of the Treaty*

51. Communication of investment projects by individuals and firms in the Community to the Commission provides sufficient information to afford an overall picture of what is being done in the Community in the realm both of nuclear research and of development and production from the technical economic and social angles.

Largely on the basis of this information, the Commission is able to lay down certain lines of action, establish its target programmes, avoid overlapping, encourage certain desirable trends — or in other words to contribute towards ensuring that the peaceful use of nuclear energy develops smoothly and rationally.

In 1966, the Commission received notice of thirteen capital projects involving a total investment of at least 754.2 million u.a. and creating 1400 new jobs for their operation alone. Seven of the projects concern power reactors valued at over 733 million u.a., representing a net current-generating capacity of 2571 MW.

Projects involving investments in excess of the limits set by the Council's Regulation No. 4 were referred to the Commission for an opinion. The Commission delivered an opinion on nine such projects during 1966.

2. *Third-party liability and insurance*

52. Unfortunately the European conventions on third-party liability (the Paris Convention on Third-Party Liability in the Field of Nuclear Energy of 1960 and the Brussels Supplementary Convention of 1963) have not yet come into force, as they have still not been ratified by all Member State despite the Commission's attempts during the past year to speed up this process. France ratified both Conventions in 1966; in Belgium the Paris Convention has been ratified and the parliamentary procedure for ratification of the Brussels Supplementary Convention completed. The rest of the Community countries have made a start on drafting the necessary bills with a view to ratification.

It is the Commission's hope that the two Conventions will be adopted in all the Community countries by 1969 at the latest so that a single body of law may apply in respect of third-party liability in the field of nuclear energy.

None of the Community countries has yet passed legislation to put these Conventions into force. In the Commission's view it is extremely important that they should not delay too long lest the principle of a single system of third-party liability as laid down in the Convention be circumvented. In 1965 a recommendation on the coordination of implementing legislation was addressed to Member States ("Journal Officiel" No. 196 of 28 November 1965). In a second recommendation dated 6 July 1966 ("Journal Officiel" No. 136 of 25 July 1966), the Commission calls on all Member States to extend the third-party liability as defined in the European Conventions to carriers of nuclear substances, thus availing themselves of a permissive provision in the Paris Convention.

A unified system is indeed a necessity if international traffic in nuclear materials is not to be affected by legislative differences. The solution advocated by the Commission was chosen because if means of transport are included in the third-party risks dealt with in the Conventions the insurance rates to nuclear industry (especially as far as maritime transport is concerned) are less than if no such inclusion is made.

The recommendation of 6 July 1966 further states that liability in cases of nuclear damage should not be restricted to a fixed ceiling for each class of victim. The Commission believes that in such cases the victim should never receive less than he would have been paid under the head of non-nuclear accident.

53. The Commission likewise feels that endeavours must be made to arrive at a uniform solution in many other respects. Hence it advocates a standard

wording for the certificate required under the Paris Convention whenever nuclear material is carried, attesting that the operator of the installation has taken out insurance or obtained some other financial security. It is also essential in the case of international transport that national authorities should recognize insurance contracts entered into with insurers from other countries and thus relieve the insured party of any obligation to take out fresh insurance in each country of transit. As far as possible, these questions should be regulated in the same way by all States which have signed the Conventions. They are at present being studied by a working group set up by the OECD, comprising governmental experts from the signatory States and Euratom representatives. Should it not prove possible to arrive at an agreement embracing all the signatory States, the Euratom Commission reserves the right to continue its endeavours towards coordination in the narrower context of the Community and possibly to submit to the Council a proposal for a directive, within the meaning of Article 98 of the Treaty.

The Commission is engaged in determining certain measures to be taken in the matter of third-party liability and insurance in cases of damage arising from the use of radioisotopes.

In the field of nuclear-risk insurance, the Commission continued to collaborate with the insurers and insurance takers grouped in the Union of Industries of the European Community (UNICE) and the electricity producers represented on the Committee for the European Community of the International Union of Producers and Distributors of Electrical Energy (UNIPED), with the object of improving the position on the insurance market. The result was the publication by the Commission in the autumn of 1966 of "Elements of a third-party liability insurance contract for operators of fixed nuclear installations (Euratom skeleton third-party liability policy in respect of installations)". This skeleton policy was drafted after two years of joint efforts in conjunction with the business circles concerned. The Commission, in presiding over the negotiations, took as its yardstick the protection of the general interest while at the same time recognizing that the skeleton policy might be negotiated between the parties in question. Thus, even though the insured persons in a contract are not legally bound by the provisions of the skeleton policy, the latter can be expected to be incorporated in the General Conditions applicable to nuclear-risk insurance.

In the same way, the Commission is at present preparing a skeleton policy to cover third-party liability in the field of carriage of nuclear substances and this may be ready for publication in a few months' time.

In line with its policy of establishing common criteria for assessing the technical risk attaching to nuclear installations (and in particular nuclear power plants) the Commission sponsored a meeting of insurers and insurance takers in 1966 with the object of obtaining the reference data needed for calculation of premiums. Owing to the limited number of nuclear risks insured, of course,

actuarial assessment of the probability of the contingency occurring on the basis of accidents in previous years is not possible. This is the first time joint action along these lines has been undertaken; it is still at the teething stage, and many difficulties have to be overcome.

The symposium on insurance policies gave rise to the formation of a group of experts, who came to the conclusion that it would be expedient to create forthwith, at Community level, a system of cataloguing and classifying incidents, accidents and major equipment failures which would make it possible later on to draw up valid statistics on the subject.

3. *Nuclear plant safety*

54. Safety studies on a number of plants in the Community proceeded normally in collaboration with the responsible national bodies within the framework of expert committees.

As stated in last year's General Report, the coordination thus achieved in safety practice deserved to be taken further by means of more systematic action.

The Commission accordingly convened meetings of experts from control agencies and safety committees and of operators and constructors from Member States to look into the practical possibilities of technical alignment. Their discussions led to the idea of fostering the comparison of information and experience acquired in specialist working groups, coupled with a system of consultation with all industries concerned in the Community.

Subjects meriting detailed examination by working groups are: standardization of (a) the form of safety reports; (b) the conditions and limits governing the operation of nuclear plants; (c) working methods and (d) inspection and test requirements, and also the possibility of standardizing certain specifications as to construction and operation.

The experts furthermore considered the question of laying down priorities in the matter of an experimental programme to back up the theoretical safety studies.

4. *Transport of radioactive materials*

55. The aim here is to secure an adequate standard of safety in the carriage of radioactive materials at reasonable and acceptable cost.

National and international regulations, stemming from the Basic Standards for protection against radiation hazards, exist to ensure the safety of workers and the general public, but these regulatory instruments must be given teeth in the form of technically and economically viable practices.

Euratom took part in consultations which in 1966 resulted in the formulation of such international regulations at world level, i.e.:

- with the International Atomic Energy Agency (IAEA) in Vienna, on rules governing the packaging and carriage of intense radioactive sources, which heading includes irradiated fuel elements;
- with the Central Office for International Railway Transport in Berne, on the revision of the RID¹⁾ regulations with reference to the latest IAEA provisions;
- with the Economic Commission for Europe (ECE) in Geneva, on drawing up, with reference to the RID regulations, annexes to the "European agreements on the international carriage of dangerous goods by road (ADR) and inland waterways (ADN)" with regulatory effect.

Regarding national regulations, the Commission made a comparative analysis of legislation in force in Euratom Member States and the IAEA regulations, the object being to bring to light divergences which still stand in the way of standardization of rules governing transport.

This analysis constitutes a contribution by the Commission to the work of the Coordinating Group on the Carriage of Radioactive Substances formed in 1962, which operates under the auspices of the Council of Ministers and consists of representatives of the Member States and of the Commission.

Furthermore, to facilitate implementation in practice of all the rules and regulations in the industrial and financial sectors, the Commission has initiated, by means of contracts, specific studies designed to translate those rules into well-defined mathematical and experimental methods relatively simple to apply. These studies are nearing completion, notably as regards the design of a pilot testing station to resolve the problems experienced by railway authorities and constructors through the fact that authorizations granted for the use of shipping containers must take due account of the requirements laid down in the regulations.

Finally, Euratom is endeavouring to promote studies aimed at a complete definition, both theoretical and practical, of the prescriptive aspects of the conveyance of radioactive materials and, ultimately, at obtaining the data necessary for revision of the international regulations, in particular those applied by the IAEA.

5. *Customs policy*

56. In 1962 and 1965, the Council suspended customs duties on reactors and reactor components and spares and on non-irradiated natural uranium or enriched uranium fuel elements.

¹⁾ International regulations concerning the carriage of dangerous goods by rail.

The relevant tariff item (ex. 80.59 B) is given below together with the suspensions in force until 31 December 1966.

84.59 B	CCT duty	Suspension rate
1. Reactors	10 %	7 %
2. Components and spares		
a) natural uranium fuel elements, non-irradiated	10 %	5 %
b) enriched uranium fuel elements, non-irradiated	10 %	wholly suspended
c) other	10 %	7 %

These suspensions being on the point of expiry, the Commission re-examined the whole problem, taking account of its implications for the Community's as yet immature nuclear industry.

The Council discussed the Commission's proposals at its sessions on 7 July and 22 December 1966. The decision taken at the latter meeting, namely, on suspension in respect of natural uranium fuel elements, was the only one to be maintained for the year 1967.

In the case of reactors, enriched uranium fuel elements and other reactors components, the 10% CCT duty came into force on 1 January 1967.

Thus the Council did not fully endorse the Commission's proposal, which was to apply a duty of 8% on natural uranium fuel elements and 5% on enriched uranium elements.

However, it instructed a working group to look into an aspect of customs practice quoted by the Commission in support of its proposal, namely, that the tariffs recommended by the Commission would give an effective protection of about 15%, in view of the fact that the value of the uranium contained in the fuel elements is also taxed on importation whereas uranium imported in the unrefined or worked up state is duty-free.

6. *Industrial documentation and card-index systems*

57. The "European Nuclear Buyers' Guide" published in January 1966 was a first attempt at listing European firms with a nuclear material fabrication capability and it met with a warm welcome. The Commission hopes to improve on it by adding further details and possibly to issue a second edition nearly next year.

The studies undertaken on the relations between European concerns and non-Member States and on the nuclear work of European firms were carried further and should enable a precise idea to be formed of the extent of nuclear energy work going on in European enterprises.

A fourth edition of the "List of Nuclear Installations in the Community" is scheduled to appear in 1967.

There was an appreciable increase during 1966 in the amount of information supplied by the Commission on the basis of documentation and card-indexes. The demand was chiefly from enterprises and bodies in the Community and from within the Commission itself.

7. Dissemination of information and industrial property.

58. No change has taken place in the Commission's policy concerning the dissemination of non-patented information deriving from the Euratom research programme, as defined by the Commission in its statement to the Council on 1 April 1963.

Firms and individuals on the mailing list for the data circulated confidentially within the Community in the form of "communications" numbered 294 at the end of 1966. A campaign is in hand to publicize these "communications" among persons and firms not yet on the mailing list who might find them of value.

Further licences were granted on patents in the Community's portfolio notwithstanding the lack of reactor prototypes, in particular ORGEL and DRAGON, in respect of which the Community holds quite a large number of patents. The number of licences granted for inventions which can be exploited independently of reactor construction is now 24, eight of them relating to patents filed by contractors. As regards patents deriving from the research programme and filed by the contractors themselves, it is the Commission's intention to check how far they are being exploited in order that it may be more fully informed on the subject and in a position, should the occasion arise, to make a start — in close collaboration with its contractors — on the marketing of these patents.

The non-exclusive licence rule written into the Treaty of Rome (Article 12) remains an obstacle to the profitable exploitation of the Community's patent portfolio. An enquiry is being undertaken with a view to safeguarding licences adequately against possible competitors while complying with the provisions of the Treaty.

However, experience has already revealed that this rule is not so hard-and-fast after all, in that an invention for which a patent is granted at the

laboratory stage must of necessity be developed and perfected by the licensee to make it a commercial proposition and the result of such work will remain his exclusive property.

Firms and individuals in the Community are kept up to date regarding patents taken out by Euratom or its contractors, more directly and in greater detail, by means of technical notices containing a short description of the features of inventions accompanied as far as possible by drawings and diagrams. A brief summary of the main clauses of licence agreements will in future be sent out with these notices.

59. In 1966, the Centre for Information and Documentation (CID) made its semi-automatic documentation system available to JRC scientists and, on a trial basis, to the main nuclear documentation centres in the six Community countries.

It will be remembered that, in accordance with the Treaty provisions on the dissemination of information, the CID had from the time it was created in 1961 set its sights on developing methods to facilitate access to all material published anywhere in the world. The mass of data in the nuclear sector available today is put at half a million "information units" (articles, reports, books, etc.) and is expanding at the rate of more than 100,000 items a year. That is the volume of information which the CID processed and stored in the electronic memories before it was ready to throw open the system to users.

Now that it possesses this unique "electronic library" of nuclear information, the CID has only to feed new documents into the system as and when published and in this it continues to enjoy the active cooperation of the USAEC. The CID can thus concentrate on the output side — supplying answers, in the form of complete bibliographies, to specific requests for information.

Following a shakedown period of a few months, particular attention being paid to the retrieval aspect, it is planned to open up the semi-automatic documentation service in 1967 to all persons and enterprises in the Community, and subsequently to those outside the Community.

Nevertheless, the CID continued to use conventional retrieval methods to meet certain demands for documentation — relating to an increasing extent to peripheral subjects — from Euratom scientists and contractors. To that end it strengthened the contacts maintained with some 300 Community documentation centres specializing in non-nuclear matters.

It likewise pursued its various endeavours to fill the gaps in the international nuclear documentation system: collaboration with the Kernforschungsanlage, Jülich, for the purposes of its monthly *Transatom Bulletin*, which gives information on nuclear documents in Slavonic or Oriental languages and available translations; association with the French company of Brevatome for the publication of the periodical *La propriété industrielle nucléaire*, which lists patents

of nuclear interest; association with the Excerpta Medica foundation in the Netherlands for publication of the bibliographical journal *Nuclear Medicine*.

In addition, the CID continues to be responsible for publishing the scientific reports drawn up by Euratom scientists and contractors under the research programme as well as two periodicals, namely, *Euratom Information*, which gives the broad outlines of the research programme, abstracts of published results and the subject-matter of contracts signed and patents granted, and the *Euratom Bulletin*, which caters for a wide public interested in questions relating to the peaceful uses of nuclear energy in Europe.

8. Safeguards and controls

60. The further growth of industrial activity in the Community during 1966 meant that Euratom's network of safeguards and controls had to be extended accordingly, both from the technical and the administrative point of view.

As mentioned above, several plants for the reprocessing of irradiated fuel have reached an advanced stage of construction, and one, Eurochemic, was commissioned during the year. This particular event concerned the Commission from the dual aspect of the approval procedure laid down in Article 78, second paragraph, of the Treaty and of the routine control now for the first time extended to the operation of this type of installation.

In the course of recent years, the Commission had already studied the plans for this plant and satisfied itself that construction was proceeding in accordance with those plans, as a preliminary to approving the reprocessing methods envisaged under the terms of the above-mentioned article of the Treaty. Having thus made sure that effective control was possible, the Commission was able to give its approval.

As to routine control, the provisions of Chapter VII of the Treaty and of Regulations Nos. 7 and 8 enable effective safeguards to be applied to Eurochemic. All the provisions enforced there by Euratom were duly approved by the United States and Canadian authorities, thus opening up the way for American and Canadian materials irradiated in non-Community countries to be sent to Eurochemic for reprocessing.

By way of an experiment, the Commission has instituted a system of continuous inspection at Eurochemic. Uncertainty as to the composition of irradiated materials entering the plant plus the technical complexity of the equipment and the inaccessibility of the materials during processing are legitimate grounds for having inspectors on hand at all times.

Euratom is also seeking to devise technical means, such as bolting and sealing, for preventing access to certain parts of the plant, thus simplifying inspection methods.

The bilateral agreements signed by Belgium and France with the United States and by Belgium and Germany with the United Kingdom have expired and have not been renewed. The materials imported from the United States or the United Kingdom by these countries on a bilateral basis will henceforward be covered by the system of external safeguards assumed by Euratom in its agreements for cooperation with the United States and the United Kingdom.

The substantial quantities of fissile materials formerly covered by these bilateral agreements have added considerably to Euratom's control responsibilities. As regards materials of American origin in particular, 7565.3 kg of enriched uranium and 403.7 kg of plutonium are now the sole responsibility of Euratom in respect of guarantees as to peaceful use.

All this brings out the heightened importance of joint consultations on safeguards and controls as provided for in the agreements for cooperation. These exchanges of views serve a dual purpose, namely, to maintain the confidence of supplier countries' authorities in the efficacy of Euratom's controls and to ensure the pooling of technical advances and practical experience in this increasingly complex and important sphere.

As was stated in the European Parliament in reply to members' questions, excellent contacts have been maintained at technical level between Euratom and the International Atomic Energy Agency (IAEA).

The principles embodied in the Euratom Treaty and the application of those principles in respect of safeguards and controls admittedly give the Euratom system a tighter hold on the materials in question, but the exchanges of views to which the Commission has confined itself in the absence of an agreement for cooperation between Euratom and the IAEA have established that the respective methods employed by the two institutions in exercising their controls are entirely comparable from the technical standpoint.

In order to discharge its ever-growing duty in the field of inspection, the Commission has pursued its endeavours to secure substantially more staff for the purpose and to provide inspectors with the most efficient technical resources.

The number of inspections carried out in 1966 was 110 against 74 in 1965, or an increase of 40%.

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

61. Contacts were maintained on matters of common interest with the Union of Industries of the European Community (UNICE) and the International Union of Producers and Distributors of Electrical Energy (UNIPÉDE).

A notable event in the field of relations with labour organizations was the conference on social questions held in Munich from 25 to 27 May 1966.

Coming as it did after the meetings in previous years at Stresa, where the Commission had discussed with labour leaders the economics of and forecasts for nuclear energy development, the Munich conference went more deeply into the social implications of the first target programme for electricity production by nuclear reactors. Among the subjects which received special attention at the Conference, that of the potential contribution of nuclear energy to regional development was referred in September 1966 to a joint working group, which concentrated on determining the positive factors likely to operate.

A consolidated report on the studies carried out and the exchanges of view resulting from them has been drawn up with a view to publication in the near future.

In order to take stock of methods and criteria currently employed in the recruitment and training of operating staff for nuclear power plants, the Commission ordered a comparative survey under contract, of the experience acquired in the various Community countries. At the beginning of the year, the Commission signed a contract for a study of the technical, economic and social implications of the development of nuclear techniques for conventional industry, this representing the initial phase of a wider investigation.

These activities were accompanied by the routine work of keeping workers abreast of nuclear developments by way of fact-finding visits to Brussels by representatives of labour unions. Euratom representatives, for their part, attended gatherings held by labour organizations, such as the Fourth European Conference of the Christian Trade Unions and the Fifth General Meeting of the International Confederation of Trade Unions in the Community.

IV. Supply

1. *Natural uranium supplies*

62. Last year saw a turning-point in the natural uranium market. This had shrunk appreciably since the cessation of strategic purchases by the United States and to a lesser degree the United Kingdom. Its salient features were the stretching out of supply contracts over a long period and the staggering of other measures taken by public authorities to help the mining industry to survive.

The substantial increase in estimates for the installation of nuclear capacity, added to the prospect of toll enrichment in the United States after 1969, prompted industrial users to turn their attention to the question of long-range natural uranium supplies.

This same concern for reliability of supplies is to be found in countries lacking in uranium sources, in those where known reserves are the most extens-

ive, and in the United States, too, notwithstanding its large resources and stocks.

What American industrial users are doing is to cover themselves by medium-term contracts and diversify their sources of supply, and this is leading to a new burst of prospecting and investment in this field (20 million dollars for the period 1966 to 1969).

At the same time, it is negotiating long-term contracts with Canada. Canadian mining companies, for their part, are once more turning to the development of resources and, a new feature, companies in which foreign participations are held have been formed for mineral exploration.

In South Africa, where hitherto uranium has been a by-product of the gold-mining industry, a company has started prospecting in an area where gold may perhaps no longer be worked as the main product but will become a by-product of uranium mining.

There was a sharp increase in mining investment in Australia in 1966, some of it being channelled to the working of uranium deposits.

As regards countries lacking in uranium ore, a 6000-ton medium-term contract was concluded by the UK with a Canadian company in 1966. This is in addition to the quantities already covered by current contracts and to stocks deriving from purchases within the framework of the Combined Development Agency. Japanese enterprises are engaged in setting up joint prospecting companies in the United States, Canada and Australia with a view to ensuring that a large share of any reserves discovered goes to Japan.

As to Community industries, the Commission is pleased to note that they too now share the increasingly widespread concern regarding dependability of supply.

Thus, within the Community, prospecting is continuing in France and has been resumed in Italy. Industry in West Germany is making preparations for test drillings to determine the value of the Menzenschwand uranium-bearing deposits. Outside Community territory, French companies are engaged in prospecting work, particularly in Equatorial Africa, and have in addition started negotiations with the Canadian mining industry for prospecting operations and the conclusion of long-term contracts. Representatives of German industry recently went to Canada to investigate the opportunities for long-term contracts and for cooperation in exploring for new deposits.

This tendency was foreseen in 1963 by the Consultative Committee of the Supply Agency in its report on "The problem of uranium resources and the long-term supply position". Today, the findings of the report strike home with more force than ever, namely:

— that a big effort must be made quickly by the uranium mining industry everywhere;

— that the conclusion of short or long-term contracts is a necessity, as is the acquisition of the Community's own resources.

The Commission, it will be remembered, endorsed these findings, believing that the measures proposed would yield better results in the context of the common supply policy.

The Community's industry is technically equipped to resolve the problems inherent in the exploitation of deposits in or outside the Community. The ore-processing capacity of Community industry today totals around 2000 tons of contained uranium annually and the methods of processing employed are well understood, at all events as far as ores used at present are concerned.

2. *Enriched uranium supplies*

63. The prospects for enriched uranium and conditions which will govern its procurement after 1969 from what is virtually the sole supplier now stand out in clearer relief. On the basis of the criteria¹⁾ previously adopted, the USAEC has drawn up specimen toll enrichment contracts on behalf of American customers. The guiding principle underlying these contracts is non-discrimination between users and they provide for some degree of stability in enrichment costs by setting a ceiling price which may not be exceeded save in the event of increases in electricity and labour costs. In addition, the customer will be able to negotiate with the USAEC a relaxation of the contract terms accorded to him so as to lessen the restrictive nature of certain clauses if need be. The net result will be that users of enriched uranium will be able to secure long-range supplies, with contracts lasting up to 30 years, on reasonable terms.

Commercial terms and other criteria applicable to contracts in respect of non-American users will be practically the same as for American customers, subject to the provisions of agreements for cooperation within the purview of which contracts must necessarily be concluded and which must set a limit to their duration.

With this in mind, the Supply Agency arranged a meeting of Community users on 28 February 1966 to consider the draft specimen contracts proposed for non-American users as communicated by the USAEC. The meeting was on similar lines to the one referred to in the Ninth General Report which was called to consider the criteria on the basis of which the specimen contracts were framed. Following the 1965 meeting, a document embodying the views of the Community circles concerned was forwarded to the USAEC through the Agency; the comments expressed received careful consideration and certain of them led to modifications in the criteria or to declarations of intent.

¹⁾ Authoritative text published in "US Federal Register" No. 248 of 23 December 1966.

Quantitatively speaking, the uranium-235 content of the enriched uranium which the US Congress had authorized the USAEC to make available to the Community was enough to supply all reactors in operation or under construction in accordance with the procedure opted for by the users, depending on the state of the enriched uranium market.

With an eye to ensuring that Community users have ready access to steady supplies, and bearing in mind the present market structure, the Commission has already paved the way for negotiations with the USAEC in order to obtain Congressional approval for additional quantities of uranium-235, even though only half the 70 tons of contained uranium-235 now available for the Community is currently covered by contracts. With the further quantities requested it should be possible, when the time comes, to meet the requirements of reactors likely to be built in fulfilment of general electric power projects.

64. During the year under review, the Commission proceeded with its survey to determine whether and if so, how isotope separation facilities for civil purposes should be set up. In these enquiries, allowance was made for changes introduced or expected in the terms governing enriched uranium supply from the United States and for the probable expansion in enriched uranium needs between now and 1980.

It is anticipated that by 1980 the free world's isotope separation installations will be running at capacity, so that new facilities will need to be brought into service. This is a new factor compared with the situation as it was a year ago.

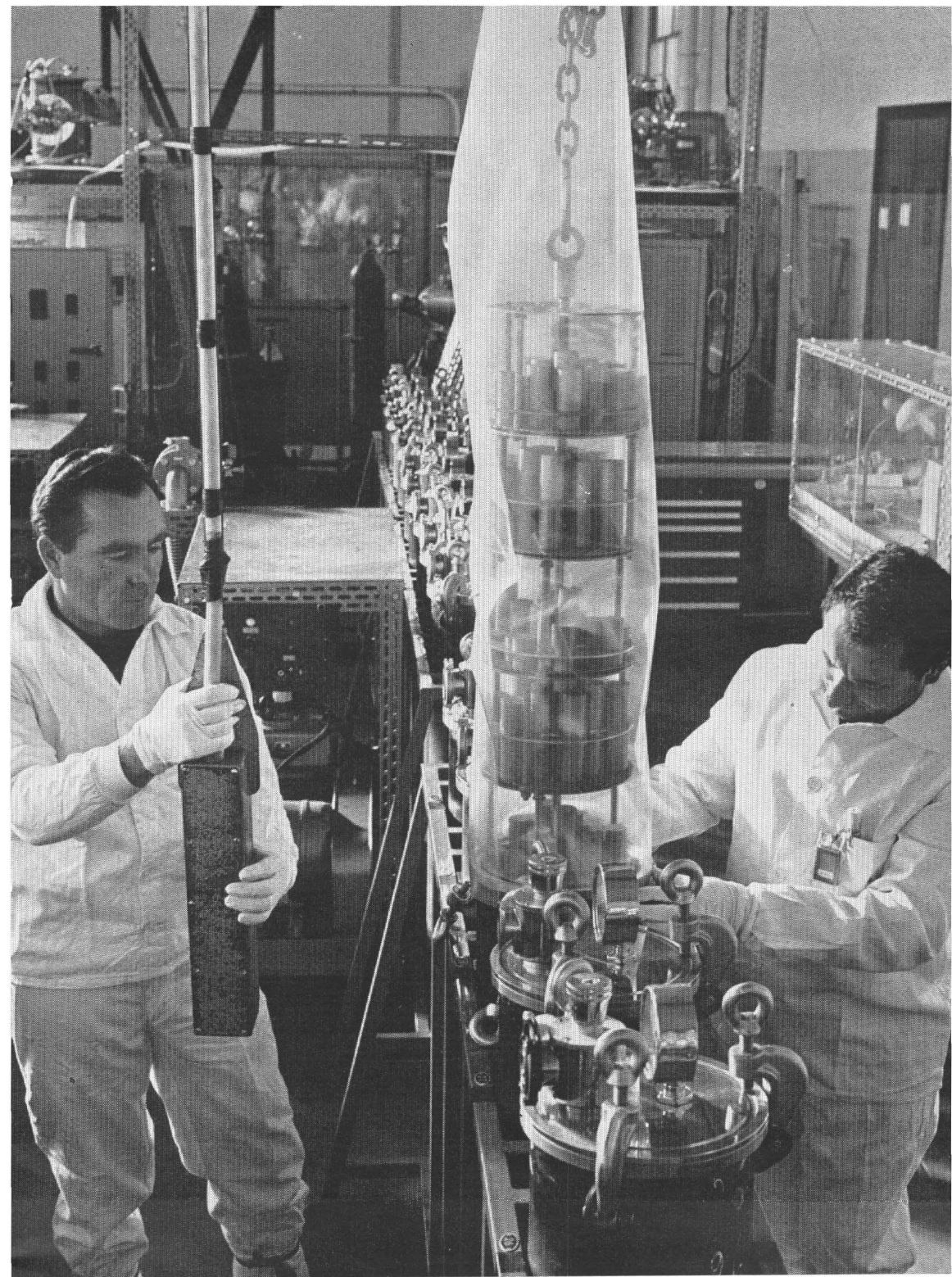
From the current investigations it is already seen to be desirable, in terms of power supply dependability and industrial policy, that a high output capacity should be available to the Community around 1980.

Under the target programme, proven-reactor and advanced-converter capacity in commission by that date will be such that an isotope separation plant would be working at full stretch within a relatively short time. On the other hand, the gradual commissioning of fast reactors will not yet result in any appreciable reduction in enriched uranium demand.

Euratom is continuing to examine the economic, political and institutional aspects of such an undertaking which, viewed from the industrial angle, would present problems as regards access to know-how, operation and the volume of investment required; these are problems which Community industry is in a position to resolve.

3. *Plutonium supplies*

65. On the plutonium front, scarcely any fundamental change was observed in 1966. There is only a limited market for this fuel. The research in which it is employed is scattered over a fairly wide field (basic research, fast reactors,



ISPRA (Italy) — METALLURGY DEPARTMENT

(See other side of page for caption)

Two technicians placing uranium carbide in the special air-tight containers.

prototypes, plutonium recycling in proven-type or advanced reactors, nuclear fuels). The power reactors in the Community have not been in operation long enough for irradiated fuel to be available. So far, only fuel from the SIMEA reactor has been sent for reprocessing in the United Kingdom.

Consequently, the relatively heavy demand far exceeds the supply of plutonium from Community sources. The Community will thus remain dependent on imports for practically the whole of its needs. The general expectation is that this state of affairs will persist at least until 1972-73, when appreciable quantities of plutonium will become available in the Community. To reduce such dependence as far as possible, the aim, as the Commission sees it, should be to set aside the plutonium produced in the Community to meet its own requirements.

Opportunities for obtaining supplies from outside the Community are likewise limited. Britain has only small amounts for export at the moment but will probably have a surplus in the future.

The 500 kg which the USAEC was authorized to make available to the Community have already been taken up. As mentioned in last year's report, the Commission began talks with the United States to secure a further 1000 kg, chiefly to fill the needs of fast reactor programmes; these talks are still in progress.

4. Implementation of Article 74 of the Treaty

66. Having noted that the quantities of nuclear fuel regularly used for research purposes had increased since 1960, the Commission, in the interests of users, amended the Regulation of July 1960 to bring it into line with the new situation. In addition to raising the level below which transactions are exempt from the provisions of Chapter VI, the new Regulation allows greater freedom of trade in fissile materials and extends its application to the import of fissile materials from non-Community countries.

5. Implementation of Article 76 of the Treaty

67. No basic change having occurred in the situation which in 1965 had prevented the adoption of the Commission's proposals for amending Chapter VI of the Treaty, it was not possible to have this matter settled at Council of Ministers level in 1966. The Commission deplors this state of affairs, which constitutes an obstacle to the formulation of a common supply policy for the Community at a time when it is most necessary.

I. Standardizing Application of Safeguards

1. *Application of the Basic Standards in Member States*

68. During 1966, numerous laws were added to existing legislation on protection against radiation hazards in force in Member States.

In Belgium, a Royal Decree amending the general regulation on the protection of the population and workers against radiation came into operation, and two departmental circulars were issued which set out procedures for keeping irradiation tables for workers and defined the meaning of the term "controlled area". The Commission had delivered an opinion on the three texts concerned in 1965. In 1966, Belgium submitted to the Commission a draft Royal Decree embodying general military regulations on protection against ionizing radiations.

In France, two decrees, drafts of which had been communicated to the Commission in 1965, entered into force. The first is of special importance in that it lays down the general principles of protection against ionizing radiations; the second amends the rules governing the transportation of dangerous materials.

A number of decrees giving effect to the Presidential Decree on radiation protection were duly enacted in Italy. These decrees, on which the Commission had already rendered an opinion, relate in particular to the possession of radioactive materials, the classification of and the procedure for licensing commercial undertakings, the carriage of radioactive materials, and certain amendments to the "Nuclear Law". Italy also transmitted to the Commission in 1966 a draft decree concerning the transportation of radioactive materials, one laying down the procedures for declaring possession of and keeping records of radioactive materials, another concerning nuclear installations subject to the provisions of Article 55 of Presidential Decree No. 185 dated 13 February 1964, and a fourth concerned with defining the types of radiation-producing devices whose use may give rise to radiations hazards. In accordance with Article 33 of the Treaty, all these draft decrees were examined by the Commission, which then informed the Italian Government of its opinion.

The vast body of legislation thus gradually built up in the Community countries gives a healthy overall picture as regards the application of the Basic Standards. Even so, it has been the Commission's endeavour throughout 1966 to seek out any remaining gaps and spur governments on to further action in this field. Within the limits of its powers under the Treaty, it has approached the Governments of Italy, Luxembourg, the Netherlands with the suggestion that they should round off their legislative provisions in the matter at the earliest opportunity.

2. *Revision of the Basic Standards*

69. The partial revision procedure was completed in 1966, the Commission having transmitted an amended draft of its proposed directive revising the Basic Standards to the Council in November 1965.

This amended version was discussed at a number of meetings of the Atomic Affairs Group, which subsequently approved it; the resulting text, after some redrafting from the legal angle by a group of experts appointed by the Council, was adopted by the latter on 27 October 1966.

Bearing in mind the advances in scientific knowledge in the field of radiation protection during recent years and the expressed wishes of the Council in this respect, the Commission is now studying the possibility of a general revision of the Basic Standards.

3. *Background radioactivity monitoring*

70. As in previous years, the Commission published two documents summarizing the background radioactivity measurement data communicated under the provisions of Article 36 of the Treaty. These data relate to levels of radioactivity in the atmosphere, water and precipitation for the year 1965 on the one hand, and to radioactive contamination of foodstuffs for 1964 on the other; they are the raw material from which the Commission plots comparisons and evaluations for the Community as a whole.

Diet constitutes the primary vector of internal contamination of the population. From evaluations of the principal nuclides such as strontium-90 and caesium-137 and of the internal irradiation dose caused by ingestion of strontium-90 by the population, it has been found that the concentrations of these nuclides in foodstuffs represent only a small proportion of the maximum permissible concentrations and that the corresponding irradiation dose may be regarded as negligible when compared with the natural irradiation to which the population is exposed.

As regards overall beta activity, 1965 saw a drop by a factor of about 5 in radioactivity in the atmosphere as compared with 1964, and in the case of radioactive fall-out the corresponding decrease may be estimated to have aver-

aged a factor of 3.5. As a result of this marked shrinkage, there will be a substantial reduction in the radioactive contamination of foodstuffs in 1965¹⁾.

The comparative survey of radioactive contamination in the diet of adolescents, begun in 1965, went ahead in 1966 with nine institutions taking part. It is still too soon to put forward any interpretation of the results obtained from the measurements and more data will be needed before an accurate idea of the position can be formed. For that reason, the programme is being carried on into 1967.

It is important to stress the value attaching to the programme of comparative studies of analytical and measuring methods which preceded the actual survey. Eleven laboratories took part in this programme, which was carried out in liaison with the International Agency in Vienna. The results of the measurements were compared and their technical aspects discussed at a meeting of experts.

This second programme of comparative studies, forming a sequel to the one conducted in 1964, is a notable example of collaboration between eleven laboratories in the Community under the sponsorship of the Commission. In view of the results recorded, it can be confidently claimed that the accuracy of the measurements now effected after these two programmes is sufficient and that there is good agreement between them. The Commission regards this as a milestone in protection against radiation hazards.

Furthermore, with a view to coordinating and rationalizing the monitoring of radioactive contamination of the environment, and in particular of the food chain, the Euratom Commission held meetings of expert groups which agreed on the broad lines to which monitoring practice should conform. Publication of the document is in hand; it contains, in the form of practical recommendations, the principles laid down by common consent of the experts and detailed proposals for the various stages of monitoring radioactive contamination of foodstuffs.

Its publication represents an important step in the field of environmental hygiene. As analytical and measuring techniques have been subjected to searching investigation under the programmes of comparative studies, Euratom's activities in this field form a coherent whole.

In the past year the Commission has tackled another major aspect with enquiries into the methods adopted for monitoring radioactivity in the vicinity of nuclear sites. When the studies are completed, it will be possible to plan for coordination of monitoring programmes in the environs of the main nuclear installations.

Also in the course of 1966, the Commission, with a view to simplifying and speeding up the analysis and interpretation of masses of measurement data, launched a well-defined plan for processing them by means of the computers in Euratom's possession.

¹⁾ The average concentration of total beta activity suspended in the air in 1965 was found to be of the order of 0,2 pC/m³, with a peak of about 0.6 pC/m³ in June.

4. *Radioactive waste*

71. In 1966, the Commission handed down opinions on six projects submitted to it pursuant to Article 37 of the Treaty. The projects in question were:

Belgium: the general specifications of the Eurochemic plant;

Germany: the Jülich Centre, the Karlsruhe Centre and the KRB power plant at Gundremmingen;

Italy: the Enrico Fermi nuclear power plant at Trino Vercellese;

Netherlands: the project for dumping radioactive waste in the Atlantic.

The European Parliament, in its report on the Euratom Ninth General Report, asked the Commission to approach the Member States concerned on the subject of giving effect to Article 37 of the Treaty. In this connection, the Commission would like to point out that at the end of 1965 it had already sent a memorandum to the French, German and Italian governments recalling their attention to the provisions of Article 37.

5. *Health aspects of nuclear plant safety*

72. The Belgian government in 1966 forwarded to the Commission a request for an opinion on the safety of the Eurochemic reprocessing plant. The matter is under examination.

Health and safety studies were undertaken on the subject of nuclear equipment at Joint Research Centre establishments. Plans to deal with emergencies were improved and general rules for protection against radiation were worked out to meet conditions at each establishment.

6. *Nuclear hygiene and medicine*

73. The two groups of experts which had begun work during the previous period met again in 1966.

The first group considered the possibility of aligning sampling and direct measurement procedures in respect of radionuclide concentrations in the human body.

As in the previous year, radioactive contamination of water resources (rivers, lakes, etc.) was the subject of a meeting of experts in 1966. On the basis of the latter's findings, the Commission has introduced the concept of the "radiological capacity" of a hydrobiological medium to express the amount of radio-

activity which can be tolerated without danger of contamination of the population or of certain population groups.

By means of this concept, it will be possible to determine maximum levels to be applied to radioactive waste disposal. In addition, two research contracts relating to decontamination of drinking water have been concluded; they will involve investigation of the physical, chemical and biological behaviour of certain radionuclides in a given hydrobiological medium.

A contract has been signed for the experimental study of the most effective methods of decontaminating the skin following exposure to radioactive contamination.

Fundamental importance likewise attaches to the understanding of the carcinogenic effects of low-dose radiations. The practical approach to the question is based on statistical surveys of exposed groups and in this field the Commission is planning a programme, spread over several years, for the study of late-developing effects in patients who have had a thorotrast injection some years earlier.

With regard to the problem of pinpointing irradiated foodstuffs, the Commission has in mind, as a sequel to the preliminary studies carried out in 1965, the conclusion of contracts with specialist national institutions for perfecting simple, practical methods of checking whether and in what circumstances foodstuffs have been irradiated and whether they are non-toxic.

7. Accidental irradiation at place of work

74. Among questions of particular significance in the safeguarding of workers is that of accidental irradiation while at work, which raises considerable problems of protection and organization in the event of a nuclear accident or incident.

A Euratom-sponsored international symposium held in Nice in April 1966 was attended by nearly 300 delegates from Community and other countries and from the international organizations concerned. Its dual purpose was to present, on the basis of data relating to the principal forms of accident, a rundown on the lessons to be drawn from such data in respect of dosimetry, industrial medicine, industrial hygiene and the administrative organization of the various radiation protection services, and to take stock of the latest scientific information calculated to improve dosimetry methods and treatment when accidents occur.

The official proceedings of the symposium will be published during the first half of 1967.

Euratom also took an active part in the first international congress of the International Radiation Protection Association held in Rome from 5 to 10 September 1966, at which world experts on health and safety were present.

8. *Social questions*

75. In the field of cooperation with trade-union bodies, further visits were paid by Euratom personnel to various national labour organizations, particularly with a view to studying questions of more direct interest to labour circles at the present time as regards applying the Basic Standards (protection of minors, pregnant women and nursing mothers, keeping workers informed of developments, etc.).

The information thus collected was used *inter alia* at two meetings held in Brussels on 1 and 15 March 1966 respectively, which were attended by a score of trade union leaders from the ICCTU and the ICFTU.

In 1965, the Commission had set about organizing a conference for ICCTU and ICFTU leaders on social problems related to the aims of the target programme. The conference, which was preceded by a series of preparatory meetings with labour representatives, took place in Munich from 25 to 27 May. One of the major themes discussed was the protection of workers against hazards arising from ionizing radiations.

Furthermore, to meet the wish repeatedly expressed in labour circles, Euratom arranged a vocational training seminar on radiation protection, which was held from 17 to 22 October at the Institut für Strahlenschutz at Neuherberg, near Munich. Some thirty trade union leaders and technicians from the six Member States followed the lectures and laboratory experiments and visited industrial plants where radioisotopes are in use.

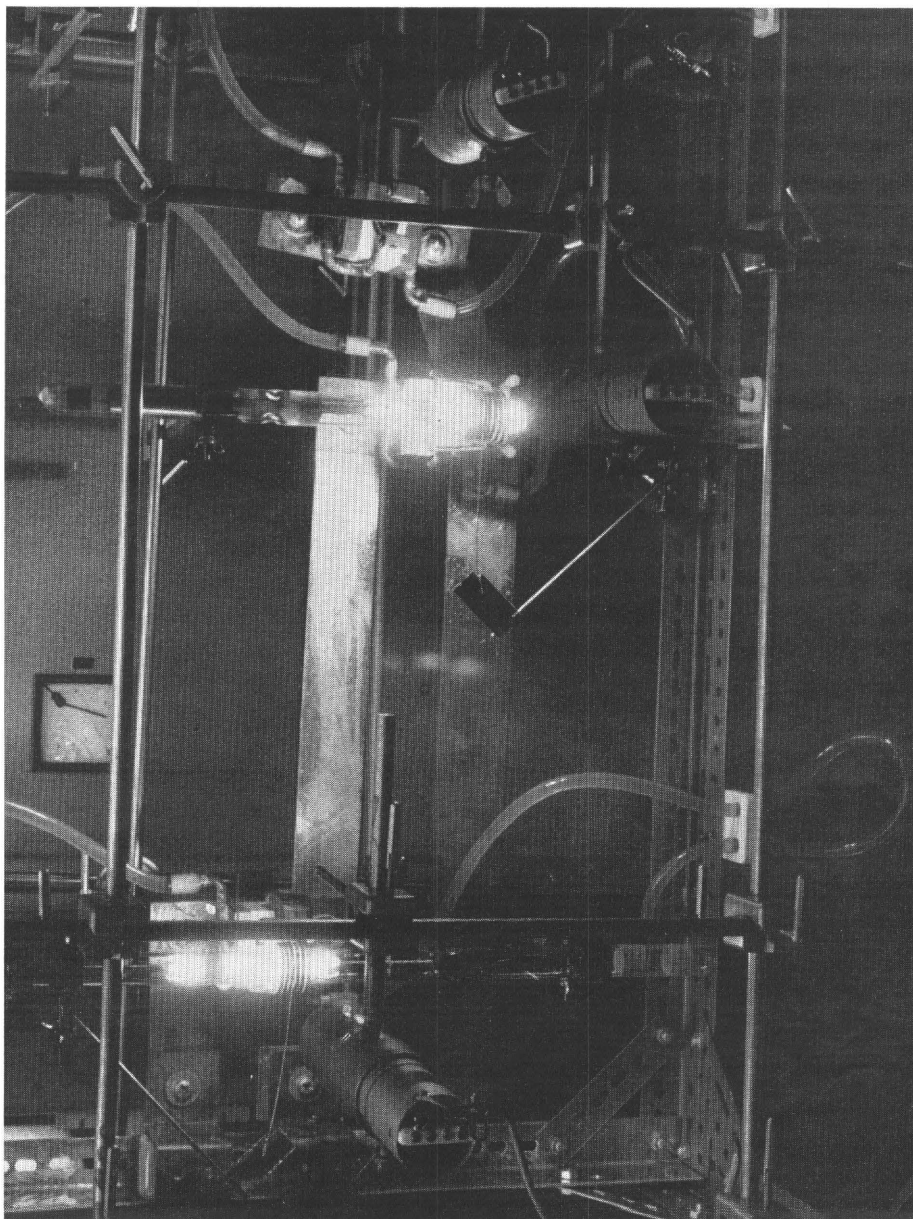
As usual, the Commission discharged its duty of keeping labour circles informed and held a number of lectures or courses for trade unionists.

9. *Documentation and studies on regulatory problems*

76. The survey on notification of radioactive hazards and, in particular, on the symbols used to indicate radioactivity was continued. Documents have been compiled by Commission staff codifying the regulations adopted on the subject by Member States and certain international organizations.

In connection with the general revision of the Basic Standards now under consideration, studies are being conducted on certain problems of protection against radiation hazards in the solution of which recent advances in scientific and technical information, and experience in applying the standards, will need to be taken into account.

In addition, bibliographical and documentary research continued on various aspects of radiological protection.



ISPRA (Italy) — DIRECT CONVERSION. TWO HEAT PIPES IN A CORROSION TEST AT 1 600 °C

II. Research and Studies

1. *Rhine Basin radioactivity study*

77. Drafting of the final report is well ahead notwithstanding certain difficulties inherent in the huge volume of data assembled and the complexities of analyzing them.

On the other hand, the study of the results of measurements of the radium-226 present in the water and river-mud was completed a little behind schedule, as was the study of strontium-90 contained in the various river-mud fractions. A first paper dealing with this research was read at an international congress in September 1966 and the final document will appear in the course of 1967.

2. *Euratom-CEA contract of association on levels of radioactive contamination of the food chain and the environment*

78. Studies relating to the calculation of levels of radioactive contamination of the food chain and the environment were pursued under the Euratom/CEA contract of association.

The main object is to discover methods and data to be used for defining, in a given situation, the limits of environmental pollution so that the irradiation doses laid down per individual are not exceeded.

The general method of calculation having been perfected during past years, current programmes consist in research into the mechanisms governing the transport of contamination through all the links in the food chain, and in the determination of the values to be assigned to the different parameters involved in those mechanisms, all of which data are necessary to the formulation of dose/pollution ratios.

Only the most outstanding advances recorded in 1966 are noted here, with particular emphasis on those which have produced directly usable results. Pride of place goes to the pinpointing of nutritional factors.

A first analysis of the data obtained from food surveys in eleven regions of the Community revealed considerable differences as regards the composition of the average intake per head and wide variations from national consumption averages calculated from the quantities of foodstuffs available.

In the next stage of analysis, now nearing completion, the per capita intake for the various age-groups in each of the eleven areas is being determined by statistical methods and the results will be ready during 1967. These data are essential for determining the critical age-group in respect of certain radio-nuclides.

Systematic research on the basic anatomy of European man and the age-conditioned variations is in progress. An initial series of studies were supplemented appreciably during the year to form a useful basis for determining contamination levels.

At the same time, very advanced research was conducted on the gastrointestinal tract and the thyroid metabolism, while an epidemiological study of strontium metabolism in children was initiated in the course of the year.

A complete bibliographical catalogue has been compiled of studies on the mechanisms and factors in radioactive contamination transport from the sources of pollution to man, evidencing the need to undertake experimental studies in the general ecological and agrotechnical conditions prevailing in the European Community.

Encouraging results were obtained in 1966 on the processes of direct strontium-85 and caesium-134 contamination in plants and the passage of these radionuclides into milk via contaminated pasture. In addition, a programme of vertical studies on the contamination of agricultural produce by fall-out has been set up at four stations in order to determine the factors governing the transfer of strontium-90 and caesium-137 from the soil.

After a preparatory phase lasting five years, the productive phase will start in 1967, in which increasingly detailed results will be progressively made available to the departments concerned.

3. *Dosimetry*

79. The systematic comparison of dosimetric films used in the Member States was carried out in three parts:

- part one, mentioned in the Ninth Report, concerned comparison of films in the 0-5 rem range;
- part two consisted of 3-50 rem irradiations obtained by exposure to X and gamma-rays of 726 films divided into four quarterly series, carried out at the CEA, Fontenay-aux-Roses, France;
- part three consisted of 30-400 rem irradiations obtained by exposure to X and gamma-rays of 422 films divided into four quarterly series, carried out in specialist laboratories at Rotterdam and Utrecht, Netherlands.

All the calibration results were sent for classification and evaluation to the relevant Euratom departments, which subsequently carried out the various error calculations in order to summarize the results in tabulated form accompanied by graphs.

This synoptic work is now finished and is at the disposal of the competent authorities in the Member States.

The centres which shared in this important experiment have in general already been able to utilize the information for improving their methods and devices.

The experiment has proved sufficiently valuable for it to be continued as requested by the competent authorities of Member States and it will probably be necessary, whatever dosimetric devices may be employed in future, to arrange for similar experiments to be conducted systematically and repeatedly.

Work on the three dosimetric research contracts signed in late 1965 and early 1966 is proceeding satisfactorily.

In 1966, a final report was published on the evaluation studies on filters used for measuring radioactivity in the air. It provides the competent authorities of Member States with all the scientific and technical data on the characteristics and efficiency of the various filters used in Community countries and will assist them in finding ways of improving measuring conditions.

During the year under review, the Commission embarked on the compilation of a list of particle accelerators in use in Community countries, together with their main characteristics. By the end of the year, 297 atomic accelerators had been recorded. The list is to serve as a basis for a survey of dosimetric devices in use at nuclear installations and of the safety measures adopted. The ultimate aim is coordination of methods of prevention, control and protection.

80. Throughout 1966, implementation of the principal agreements for cooperation concluded by Euratom — and in particular those with the United States, the United Kingdom and Canada — proceeded smoothly and satisfactorily. Possibilities for extending certain of these agreements to new sectors crystallized and negotiations for that purpose are in hand with both the United States and the United Kingdom. The long-standing good relations with many international organizations were maintained and there was a further rise in the number of non-Member States with diplomatic missions accredited to Euratom.

I. Relations with Non-Member States

1. *Countries with which Euratom has concluded agreements for cooperation*

81. Cooperation between the Euratom Commission and United States Atomic Energy Commission (USAEC) on proven-type reactors (instituted several years ago) and on fast reactors (set up in 1964) has developed steadily. In the light of the satisfactory results obtained from research in the latter field conducted jointly by Euratom and its associates, it has been possible to estimate plutonium needs for current fast reactor programmes in the Community until 1971. To meet these requirements, the Commission has made a point of taking all appropriate steps forthwith to ensure that plutonium supplies for the programmes concerned may continue to be regularly channelled through the Euratom/US Agreement for Cooperation, in view of the fact that present Community output of plutonium is inadequate to the purpose. Accordingly, the Commission asked the United States Government to set in motion the requisite internal procedures for increasing the amount of plutonium which may be made available to the Community under the terms of the relevant American legislation. The ceiling figure set by the US Congress in August 1964, it will be remembered, was 500 tons. The Commission's latest request has been under deliberation in the United States for some months now.

Still in the realm of fast reactors, the inclusion of Euratom's Belgian and Netherlands associates in the Euratom/USAEC Agreement of 25 May 1964 has not yet resulted, as the Commission had proposed, in an amendment to the

original agreement. However, since April 1966 the two associates have been enjoying the *de facto* benefit of information exchanged under the agreement.

The Commission notes that in 1964 the USAEC expressed the hope that Euratom/US cooperation might be extended to the heavy-water-moderated organic-liquid-cooled reactor series. After it had been confirmed to the Commission in 1965, this proposal was discussed first at technical level between the Euratom Commission and the USAEC and then, at the request of Member States, in exploratory talks between the two parties. With prospects of agreement assuming more distinct form, negotiations proper were started; they are being conducted by the Commission on the basis of directives adopted in July 1966 by the Council of Ministers.

82. Cooperation under the agreement between Euratom and the United Kingdom during the past year was concerned more particularly with the research sector, economic problems and nuclear insurance.

The Continuing Committee for Euratom/United Kingdom cooperation, meeting in London on 10 October 1966, agreed to extend exchanges of information to long-term supply policy and to the role of nuclear power in overall energy policy.

Meanwhile, although the extension of the agreement to cover fast reactor physics has not yet been rendered possible by rephrasing certain clauses, an important contract has nevertheless been signed for the irradiation of fuel and materials for the Community's fast reactor programme in the UKAEA's fast reactor at Dounreay.

83. There is nothing new to report in respect of cooperation between Euratom and Atomic Energy of Canada Limited (AECL), which, under the agreement renewed in 1965, relates chiefly to the coordination of research programmes on heavy-water-moderated reactors.

2. *Other countries*

84. Technical relations with Sweden as regulated by the working arrangement concluded between the Commission and AB Atomenergi in 1964 continued smoothly.

Prospects for cooperation with Japan and Israel are still a Council pre-occupation.

3. *Missions accredited to Euratom*

85. In 1966, Chile and Gabon accredited missions to the Community, bringing the number of countries maintaining diplomatic relations with Euratom to 27, namely, Argentina, Australia, Austria, Brazil, Canada, Chile, Denmark,

Finland, Gabon, Greece, Iran, Ireland, Israel, Ivory Coast, Japan, Norway, Pakistan, Portugal, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Upper Volta and Venezuela.

II. Relations with International Organizations

86. The Commission continued to participate in the work of the Organization for Economic Cooperation and Development (OECD), and more especially in the activities of certain of its committees — those on energy and electricity, science policy, cooperation in research, and scientific and technical manpower. Euratom specialists on many occasions attended meetings of experts such as the working parties or sub-committees on intense magnetic fields, scientific and technical information, air and water pollution and pesticides.

As in past years, there was fruitful cooperation between Euratom and the European Nuclear Energy Agency. The Euratom Commission participates actively in the work of the ENEA and of its Steering Committee in accordance with Additional Protocol No. 1 to the OECD Convention and Article 21 of the Council's decision setting up the ENEA.

Still in the ENEA context, the second renewal of the DRAGON Agreement took effect on 1 April 1966; it provides for expenditures of 4.35 million u.a., 46% of which is to be borne by Euratom, over a period of nine months from 1 April to 31 December 1967.

In 1966, those in charge of the project proposed a further renewal of the agreement until 31 March 1970, in order to reap full advantage from the investment so far. The new programme would consist solely in operation of the reactor and fabrication and post-irradiation examination of the fuel, including a very limited programme of research on this fuel. On technical grounds, the Commission is well disposed to such renewal, which is under study by the Council and more generally by the signatories.

As in previous years, the Commission was represented, at the invitation of the Board of Governors, by an observer at the General Conference of the International Atomic Energy Agency (IAEA) (Tenth Ordinary Session, Vienna, 21-28 September 1966). Working relations were maintained as before between the competent departments of the Commission and of the Agency Secretariat.

Of interest in this connection is the emergence within other Community institutions — the Parliament and the Council — of a trend in favour of more concrete cooperation arrangements between the IAEA and Euratom, notably in respect of safeguards and controls. The Council has before it proposals to that effect from two of the Member States.

The Commission, which has every reason to be satisfied with the many contacts which it has established with the IAEA at technical level, has indicated that it too would be glad if those contacts could be given appropriate form. What it had in mind was the conclusion of an agreement for cooperation under which, among other things, a solution could be sought to questions of controlling the use of fissile materials for peaceful purposes.

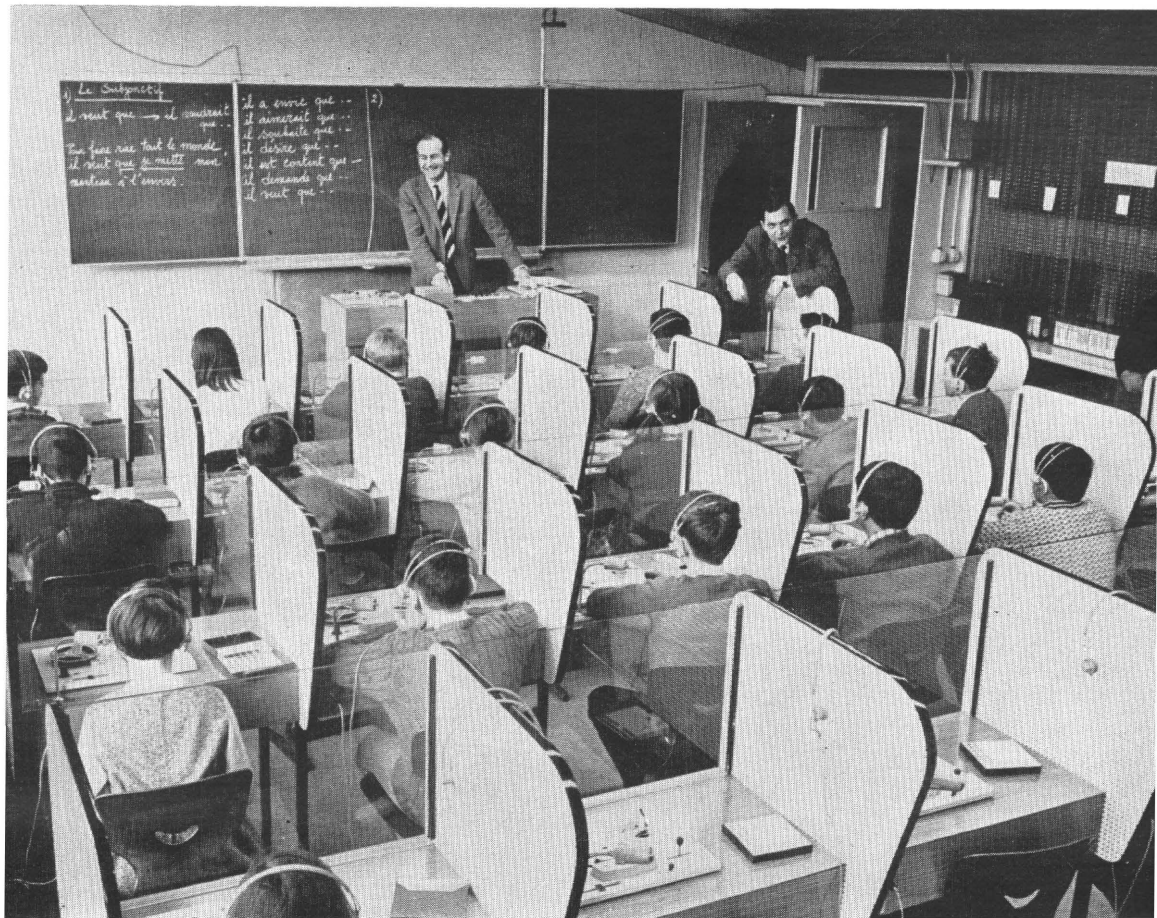
At the beginning of 1967, the Commission was consulted by the United States Government, pursuant to the 1958 Euratom/US Agreement, regarding certain aspects of a draft treaty on the non-proliferation of nuclear weapons. The Commission at once informed the Council of the points at issue in the consultations and of the observations which in its view were prompted by various aspects of the texts submitted to it by the US Government. Meanwhile, the consultations between the Commission and the American authorities have been pursued uninterruptedly; the Commission has had an opportunity of making known its views to Mr. W.C. Foster, Director of the US Arms Control and Disarmament Agency (ACDA), and United States representative at the Geneva Disarmament Conference, and subsequently to the US Vice-President, Mr. H.H. Humphrey, himself, when he visited Europe in March 1967.

In line with the good relations which exist between the Community and the United Kingdom, consultations have likewise taken place between the Commission and Lord Chalfont, Minister of State at the Foreign Office and head of the British delegation to the Geneva Conference.

Two points stand out. The problem of the control of special fissile materials delivered to the Community by the United States Government is explicitly governed by the Euratom/US agreements, and recognition of Euratom's system of controls and the value and effectiveness of these controls form an integral part of the agreements concluded between the Community and the US Government, which can hence only be modified by altering the terms of the said agreements. Furthermore, since the safeguards provided for in those agreements are tantamount to Community controls as prescribed in the Euratom Treaty, any alteration in their terms, their aims or procedures has to be made in accordance with the relevant provisions of the Euratom Treaty. Euratom control is based on the principle of equal rights which forms the very foundation of the European Communities. It is non-discriminatory in its application to the peaceful use within the territory of all Member States of the material referred to in the Treaty, whether or not they are in possession of nuclear arms. This gives effect to the cardinal principle of non-discrimination.

The signature of a non-proliferation treaty by certain Member States must not give rise, by reason of the control clauses of such a treaty, to elements of discrimination or discord within the Community.

This in no way rules out, as mentioned above, the possibility of Euratom signing a technical cooperation agreement with the IAEA to enable the effectiveness of that control to be verified by mutually approved scientific procedures.



BRUSSELS, EUROPEAN SCHOOL : AUDIO-VISUAL INSTRUCTION

The continuing consultations carried on in permanent liaison with the Council authorities between the Commission and the US authorities have been a factor in persuading the latter to amend certain provisions of its draft non-proliferation treaty in the direction of eliminating the difficulties which its control clauses occasioned the Community.

That was the position at the time of writing this Report.

86a. Mention must also be made of the good working relations maintained by the competent Euratom departments with those of OCAM (Organisation Commune Africaine et Malgache). The Commission is regularly represented by an observer at the meetings of the OCAM scientific and technical research committee. It also had a representative at the third annual meeting of the Parliamentary Conference of the Association between the EEC and the Associated African States and Madagascar (Abidjan, 10-14 December 1966).

Lastly, during the year under review Euratom continued to maintain good ties with the International Labour Organization (ILO), the World Health Organization (WHO), the United Nations Food and Agriculture Organization (FAO), the Inter-American Nuclear Energy Commission (IANEC) and the Council of Europe.

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

87. No new draft agreements were notified to the Commission by Member States during the year.

On the other hand, several bilateral agreements entered into by Member States prior to the Treaty's coming into force and communicated to the Commission pursuant to Article 105 have recently expired and have not been renewed. They are the agreements between Belgium and the US, Belgium and the UK, the Federal Republic of Germany and the UK, and France and the US.

Henceforward the provisions of the Community agreements with the United States and the United Kingdom supersede, in respect of controls and supplies, those of the former bilateral agreements between the Member States in question and the two non-Community countries.

I. The European Parliament

88. 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.

Session of 7 to 11 March 1966

At its constituent session in March, the Parliament elected its new Bureau. Mr. Poher was elected President and Messrs. Kapteyn, Battaglia, Vendroux, Furler Wohlfart, Berkhouwer, Carboni and Metzger were elected Vice-Presidents.

The agenda for the session included a debate on the operating budget and on the research and investment budget for the financial year 1966 (rapporteur: Mr. Battaglia).

The members approved Mr. Battaglia's report as a whole and expressed concern as to the future of the Ispra establishment and the third five-year programme.

Messrs. Sassen, Margulies and De Groote stressed that, subject to supplementary budgets, the Euratom budgets would enable the Commission to pursue its activities normally.

At the close of the debate the Parliament adopted a resolution stating that the draft operating and research budgets of Euratom for the financial year 1966 were deemed to have been finally adopted in accordance with Article 177, Para. 4, of the Treaty and that it expected the Euratom Commission to submit to the Council within the first few months of the financial year preliminary draft proposals for a supplementary budget to enable current difficulties to be surmounted.

The March session of the Parliament was the occasion of an important political debate on the results of the Extraordinary Meeting of the Council in

Luxembourg¹⁾ (rapporteur: Mr. Metzger). This debate culminated in the adoption of a resolution in which the Parliament expressed satisfaction that Council members had agreed to a resumption of the normal pattern of Community working. At the same time, it voiced concern over the persistent uncertainties as to the interpretation of certain points in the texts published at the end of the Council session on the ideas and decisions of the Council, and considered that the latter should not abandon all possibility of taking majority decisions.

The same session included the discussion of a report by Mr. Merten on the European schools. This was followed by the adoption of a resolution testifying to the Parliament's profound interest in these schools and calling upon Member States to encourage and help them in accomplishing their task and to ratify the protocol on European schools as soon as possible.

The Parliament also adopted a resolution on the second Parliamentary Conference of the Association between the EEC and the Associated African States and Madagascar (rapporteur: Mr. Metzger), recommending the Councils and Executives to take the necessary steps to achieve the aims set forth in the resolution of 8 December 1965 on the first annual report of the Council of the Association.

Session of 9 to 13 May 1966

The Parliament debated a project to set up a European Youth Office (rapporteur: Mr. Scarascia Mugnozza). The spokesmen for the political groups supported the project, which was approved unanimously.

At the May session, the President of the High Authority introduced its Fourteenth General Report and the Parliament also heard a statement from Mr. Marjolin, Vice-President, on the Council of Ministers' decision of December 1965 on agriculture.

Session of 27 June to 1 July 1966

Mr. Carelli presented the Ninth General Report of the Euratom Commission and Mr. Chatenet, President, replied to oral questions Nos. 3 and 4 put by Mr. Martino and Mr. Pedini regarding certain statements he had made to the press.

The President in office of the Councils made a speech dealing mainly with the financing of the common agricultural policy and the multilateral negotiations taking place within GATT.

The Parliament further held a debate on the first target programme for nuclear energy production in the next few years (rapporteur: Mr. Hougardy).

¹⁾ Held on 17-18 and 27-28 January 1966.

This ended with the adoption of a resolution agreeing with the Commission that it is more than ever necessary to draw up balanced estimates of the crude oil, natural gas and coal supplies required by the Common Market, in order to bring out more clearly the value of the target programme.

The Parliament likewise recommended that the medium and long-term estimates should be amended as and when necessary and should automatically come up for revision.

Finally, following discussion of Mr. Van Hulst's report on Euratom's activities in the matter of aid to the emerging countries, the Parliament adopted a resolution calling upon the Euratom Commission to inform the Committee on Cooperation with Developing Countries as soon as possible of the action to be taken on the projects it has under consideration.

*Thirteenth Joint Session of the European Parliament
and the Consultative Assembly of the Council of
Europe*

The thirteenth joint session of the two assemblies took place in Strasbourg on 23 and 24 September 1966 with first Mr. Poher, President of the European Parliament, and then Mr. de Freitas, President of the Consultative Assembly of the Council of Europe, in the chair.

The theme chosen for this meeting was a wider European Economic Community and Europe's place in the world politics and economics.

The report presented by Mr. Catroux on behalf of the European Parliament laid stress on the opportunities for a European science policy and on the relations between the Six and the Seven, in particular the need for coordination in foreign policy and technical cooperation.

Referring to the possibility of the EFTA countries joining the Common Market, the rapporteur emphasized that a single free-trade area combining the EFTA and the EEC countries would deprive the Community of one of its chief advantages, namely, its power to exercise a regulatory influence on the world economy.

Speaking for the Consultative Assembly of the Council of Europe, Mr. Czernetz expressed his conviction that, with its wide freedom of action, that body constituted the right forum for uniting the efforts of Europe to assume its world responsibilities.

Mr. Sassen recapitulated the Commission's experience over a period of nearly nine years and went on to comment on the report presented by Mr. Catroux. He concluded by urging the need for the political will and unremitting determination to set on foot a large-scale campaign of lasting effect for rationalizing scientific and technical activities.

In the general debate, a number of speakers made clear the willingness of the two assemblies to study the problems raised by the possibility of a fresh dialogue between the Community and the United Kingdom and other EFTA members. The speeches by British parliamentarians belonging to the two main parties evoked special interest.

Session of 17 to 21 October 1966

The debate on Euratom's Ninth General Report, stemming from a report by Mr. Battaglia, was on the agenda of this session.

The rapporteur underlined the main problems currently confronting Euratom, saying that they could be solved only if there was a real political will to do so. He paid tribute to the Executive's efforts to promote a Community policy on research, quoting in particular the first target programme.

Mr. De Groote replied to questions raised in Mr. Battaglia's report and outlined the Commission's future plan of action.

Many speakers joined in the debate, among the matters discussed being fast reactor problems, the future of the Ispra establishment, isotope separation and training of research workers.

The Parliament finally adopted the following resolution:

"The European Parliament,

- Having regard to the Ninth General Report of the European Atomic Energy Community (doc. 59-I/II) and the Documentation Annex attached thereto (doc. 59-III);
- Having regard to the report drawn up by Mr. Battaglia, pursuant to the Resolution of 7 March 1966 (doc. 109);
- Endorses the observations and conclusions of the said report and in particular,
 1. Regrets that the Governments of the Member States have not yet reached an agreement which will make it possible to give effect to the Treaty of 8 April 1965 merging the Executives, which has already been ratified by the national Parliaments;
 2. Finds confirmation in the General Report of the important role which Euratom is called upon to play under the provisions of the Treaty setting up Euratom in making nuclear energy an instrument for consolidating the process of European integration;

3. Emphasizes that the merging of the Executives would afford the means of ensuring the harmonious development of nuclear energy as part of a general economic policy and, more particularly, in the context of a Community energy policy;
4. Considers it essential to safeguard, in the single Executive, the features peculiar to the Euratom Treaty and also the Community's special functions which cannot be covered by other sectors and will in certain cases require separate administrative departments;
5. Being convinced of the urgency of the above-mentioned problems, instructs the Political Committee to submit in time for the first 1967 session, after obtaining the opinion of the Energy Committee, the Research and Cultural Affairs Committee and the Administration and Budgets Committee, a report setting out the problem in all its aspects together with the solutions recommended;
6. Requests the Executive and the Council to use every endeavour to keep the standard of qualification of the Community's scientific and technical personnel at the highest possible level and to improve working conditions at the Joint Research Centre;
7. Urges governments, in view of the limping pace of research in Europe, to adopt appropriate measures so that efforts may be concentrated within the Community and full importance assigned to the Euratom Joint Centre by extending its competence to cover all other branches of research;
8. Instructs the Research and Cultural Affairs Committee to draw up a report on the subject and submit detailed conclusions as soon as possible;
9. Being concerned as to the outlook for the ORGEL project, which has cost a considerable sum of money and mobilized a very large group of research workers, and convinced of the need for informing public opinion about the future of this project, instructs the Research and Cultural Affairs Committee to submit a report on the problem after obtaining all such information as it may deem necessary;
10. Expresses its satisfaction regarding the Executive's activity, more especially in the matter of information and documentation, external relations and relations with emerging countries;
11. Calls upon the Executive to lay due stress in its next General Report on action taken to give effect to the requests presented in this Resolution and in the report on the Ninth General Report (doc. 109)."

Two other important debates at the same session were those on science policy and on the development of Community institutions.

The debate on science policy was based on two reports, one by Mr. Oele on technological progress and scientific research within the Community and

the other by Mr. Schuijt on a resolution moved by Mr. Martino regarding a joint European policy for science.

Mr. De Groote took the opportunity to bring to the Parliament's notice the knowledge and experience accumulated by Euratom in the organization and practical execution of a joint research programme and set forth the broad outlines of a European programme of scientific and technical research while noting that it would be utopian to expect to solve every aspect of the problem.

At the end of this debate, the Parliament adopted two resolutions.

In the first, it voiced the expectation that closer cooperation between the relevant departments of the Executives would enable the experience of the EAEC and the ECSC in scientific research to be put to still better use, while retaining well-tried methods of programme coordination and implementation.

It also requested the Executives to make known their ideas as to the principles and material basis for a joint science policy and hoped that the European Parliament would have an opportunity of holding constructive debates on science policy on the basis of a report on Community science policy to be prepared by the EEC Commission.

In the second resolution, the Parliament expressed the hope that the Communities would continue to discharge their specific duties as prescribed by the Rome and Paris Treaties, both by way of medium-range economic policy programmes and by coordination of the Member States' research policies within the Interexecutive Working Party on Research.

The Parliament felt that advantage should be taken of the valuable experience acquired by Euratom in research policy in its specific field and that the question should be considered as to how far the implementation of Community research programmes should be left to Euratom or entrusted to a special body deriving from the future single Commission. It also recommended that the three Communities should organize a European symposium with the aim of securing action in the formation of a joint science policy.

The debate on the development of the Communities' institutions was introduced by a statement by Mr. Illerhaus (rapporteur), who pointed out that the structure of the Community did not satisfy all the desiderata, one of its defects being the Parliament's lack of "teeth". He pointed out, too, that there was no proper division of power.

At the close of the debate, the Parliament adopted a resolution under which the EEC Commission was asked to ensure that the Parliament was consulted on all measures of political importance, irrespective of whether or not the Treaty or the relevant regulation explicitly prescribes such consultation.

In the case of proposed amendments not being acted upon by the Council, the Parliament asked to be duly informed of the reasons for the Council's

decision and of the grounds on which the Commission had presented a draft not in keeping with the Council's proposals.

Further, the EEC Commission was invited to make full use of its prerogative pursuant to Article 149, first paragraph, of the Treaty, in the interests of delimitation of authority in negotiations at the Council.

Following a budget debate (rapporteur: Mr. Merten), the Parliament voted two resolutions, one approving the supplementary budget for the DRAGON reactor and the other stressing the urgency of regularizing the financial and budgetary position of the EAEC.

Conference of Community Institutions (28 November 1966) and Session of 28 November to 2 December 1966

The subject of the annual conference with the Councils and Commissions held on 28 November 1966 was the situation of the Community and the outlook for economic union.

Mr. Luns, President in office of the Councils, in his opening statement, pointed out that the Community was flourishing, as could be seen from the growth in trade, and that matters transcending the requirements of a simple customs union were already covered by its regulations.

Speaking in the subsequent debate, Mr. Carelli urged the need for effective action in the field of scientific and technological research, with special reference to Euratom's experience.

The Parliament at this session adopted a resolution on the EAEC draft operating budget for the financial year 1967 and on other Euratom budget questions.

Session of 30 January to 3 February 1967

With a report by Mr. Merten as its working document, the Parliament debated the supplementary research and investment budget. It voted a resolution to adopt the supplementary budget but expressed the hope that the whole of the payments arising from commitments under the second research programme might be effected, in accordance with normal financial practice, out of credits assigned for the purpose in the draft research and investment budget for 1967.

Conference of EEC/EAMA Association

The Euratom Commission took part in the Parliamentary Conference of the Association between the EEC and the Associated African and Malagasy States at Abidjan from 10 to 14 December 1966. Mr. Margulies informed the

conference of progress in the use of nuclear techniques for the benefit of the Associated States.

A resolution was adopted expressing satisfaction that the Euratom Commission's studies on peaceful applications of nuclear processes in the Associated States had culminated in the development of extremely worthwhile projects.

The Commission also sent delegates to bipartite meetings on an equal-representation basis of the Parliamentary Conference of the Association at Mogadishu from 24 to 29 September and at Abidjan on 12 December 1966.

II. The Council of Ministers

106th Session (28 February - 1 March 1966)

89. The Council met under the presidency of Mr. Pierre Werner, Minister for Foreign Affairs of the Grand Duchy of Luxembourg.

It approved the drafts of letters to be exchanged between the Euratom Commission and Atomic Energy of Canada Limited (AECL) for a one-year renewal of the technical agreement on the peaceful use of nuclear energy signed between the EAEC and AECL in 1959.

The Council took note of the agreement which was the subject of the exchange of letters which had taken place between the Euratom Commission and the International Bureau of Weights and Measures to confirm their mutual consent to the continuance and intensification of existing cooperation in the matter of ionizing radiation measurement standards.

109th Session (4, 5, 9 and 10 May 1966)

The Council met under the presidency of Mr. Pierre Werner.

At this session it approved the text of the agreement extending and amending the revised Agreement on the DRAGON high-temperature gas-cooled reactor project and authorized the Commission to sign the agreement.

111th Session (13-14 June 1966)

The Council, meeting under the presidency of Mr. Werner, approved a third amendment to the articles of the joint enterprise Kernkraftwerk Rheinisch-Westfälisches Elektrizitätswerk - Bayernwerk GmbH providing for a further increase in the company's capital.

114th Session (28 July 1966)

The Council met under the presidency of Mr. S.A. Posthumus, Secretary of State for Transport of the Kingdom of the Netherlands.

It authorized the Commission to enter into negotiations with the USAEC with a view to the conclusion of an agreement for the exchange of information in the heavy-water-moderated organic-liquid-cooled reactor field.

At the same meeting, the Council decided to accord joint enterprise status to the Kernkraftwerk Obrigheim GmbH and to extend to that company certain of the advantages which may be granted under Annex III to the Euratom Treaty.

Lastly, it approved the increase in the capital of the joint enterprise Société d'Énergie nucléaire franco-belge des Ardennes (SENA) as resolved upon by the extraordinary general meeting of that company.

115th Session (21-22 September 1966)

The Council met under the presidency of Mr. Joseph Luns, Minister for Foreign Affairs of the Kingdom of the Netherlands.

It approved a draft supplementary research and investment budget for the financial year 1966 providing for:

- the opening of a supplementary annual credit of two million u.a. under item 400 (DRAGON reactor);
- a new schedule of "commitments and payments" to replace the one appended to the research and investment budget for the financial year 1966.

116th Session (26-27 October 1966)

Meeting under the presidency of Mr. Joseph Luns, the Council approved the draft operating budget of the Community for the financial year 1967.

In addition, it adopted a directive to revise the Basic Standards for the Protection of the Health of Workers and the General Public Against the Dangers Arising from Ionizing Radiation.

This was followed by an exchange of views concerning a preliminary draft supplementary research and investment budget for 1966 submitted by the Commission on 13 May 1966, with the aim of increasing authorized staff by 54 new slots for the financial year 1966.

Lastly, the Council gave the Commission discharge in respect of the budgets for the financial year 1963.

The Council confined itself to brief discussion of three other questions on its agenda, namely:

- further revision of the second five-year programme;
- preliminary draft research and investment budget for the financial year 1967;
- Euratom/CNEN association in the fast reactor field.

No conclusion having been reached on these questions, the Council agreed to instruct the Committee of Permanent Representatives to proceed as soon as possible:

1. to seek a solution to the problems arising in regard to plutonium for use in the MASURCA critical experiment;
2. to examine the Commission's proposal for amending the last paragraph of item VII, "Fast Reactors", of the second research programme (PEC project).

118th Session (6-7 December 1966)

The Council met under the presidency of Mr. Joseph Luns.

At this session it heard a statement by the Italian Minister for Foreign Affairs, Mr. Amintore Fanfani, on the problems posed by the "technological gap" between the United States and Europe. After a brief exchange of views, the Council agreed to devote a special session to the question during the first half of 1967.

The Council adopted, by qualified majority vote, a draft supplementary research and investment budget for the financial year 1966 providing for an additional 10 million u.a. of payment authorizations, thus bringing the total payment authorizations for the financial year 1966 to 125.5 million u.a.

Next, the Council granted the Commission's request for authorization of the provisional instalment of three-twelfths at the beginning of the financial year 1967, the research and investment budget for the year still not having been adopted by the Council.

Finally, the Council heard a statement by the German delegation concerning relations between the Community and the International Atomic Energy Agency. The Council went on to instruct the Committee of Permanent Representatives to examine the problems outlined in the statement in order that the Council might pronounce on the matter at a future session.

The Council met under the presidency of Mr. Joseph Luns. It adopted a decision prolonging the partial suspension of Common Customs Tariff duties on non-irradiated natural uranium fuel elements, CCT No. 84.59 B II a), at the rate of 5% until 31 December 1967. It also noted a request submitted by the German delegation for modification of the Common Customs Tariff duties on non-irradiated natural uranium and enriched uranium fuel elements, CCT Nos. 84.59 B II a) and b).

The Council also gave final approval to the Community's operating budget for the financial year 1967.

Other activities of the Council

90. At its 106th Session (28 February and 1 March 1966), the Council appointed Mr. Werner Henze as a member of the Economic and Social Committee in succession to Mr. Butschkau, and Mr. Bruno Fassina as a member in succession to Mr. Macario.

At its 107th Session (21 and 22 March 1966), the Council adopted the adjustment factors applicable to the salaries of officials and other servants of the Communities on and after 1 January 1966.

It further instructed the Committee of Permanent Representatives to examine the possibility of extending the limits of retrospective effect in applying those adjustment factors.

The Council elected new members of the Economic and Social Committee at its 109th Session (4, 5, 9 and 10 May 1966).

It also decided at that meeting to apply the adjustment factors adopted at its 107th Session with effect from 1 October 1965.

Regarding the supplementary proposal by the EAEC and the EEC Commissions dated 1 March 1966, based on Article 65, Para. 1, of the Service Regulations, the Council decided to postpone consideration of the matter until a later date. The Commissions expressed regret at this postponement, which was not in conformity with the Service Regulations, in which the Council is enjoined to take account, in its decision, of all the elements mentioned in Article 65, Para. 1, and hence likewise of those set forth in the supplementary proposal of the Commissions.

At its 112th Session (13 and 14 July 1966), the Council appointed Mr. Georges Bréart as a member of the Economic and Social Committee in place of Mr. Halle, who had been unable to accept his appointment made in May.

At its *113th Session (22, 23, 24 and 26 July 1966)*, the Council discussed proposals submitted by the EAEC and EEC Commissions early in June 1966 on the basis of Article 65, Para. 2, of the Service Regulations, and reached the conclusion that no action to modify the adjustment factors was called for.

At its *114th Session (28 July 1966)*, the Council, pursuant to the second and third paragraphs of Article 14 of Annex VII to the Service Regulations, adopted the Regulation setting forth the list of places where an accommodation allowance may be granted, the maximum amount and the conditions relating to the payment of such allowance, together with the Regulation setting forth the list of places where a transportation allowance may be granted, the maximum amount and the conditions relating to the payment of such allowance.

The Council at its *115th Session (21 and 22 September 1966)* appointed Mr. Igino Caprio as a member of the Economic and Social Committee in place of Mr. Lapo Hazzei, who had been unable to accept his appointment made in May 1966.

At its *117th Session (24 and 25 November 1966)*, it proceeded to appoint Mr. G. Gerritse to be a member of the Economic and Social Committee in succession to Mr. W. Abeda, who had resigned.

At its *118th Session (6 and 7 December 1966)*, the Council adopted the adjustment factors applicable, with effect from 1 December 1966, to the salaries of officials and other servants of the Community.

III. The Court of Justice of the European Communities

91. During the period covered by this report, four new actions to quash decisions on the part of the administration were brought before the Court by Euratom officials under the terms of the Service Regulations.

The Court pronounced judgement in eight other similar suits; five were rejected as lacking in grounds or dealing with matters outside the Court's jurisdiction; in three cases the Court found for the plaintiffs either as to the whole or as to the main part of their complaint.

IV. The Economic and Social Committee

92. The year 1966 was marked by the election of a new Economic and Social Committee for a four-year period.

At its constituent session on 28 June 1966, Mr. Major (Belgium) was unanimously elected Chairman, Mr. Kramer (Germany) and Mr. Germozzi (Italy) being elected Vice-Chairmen.

Peripheral to the plenary session of 27 to 29 September 1966, the nuclear working parties appointed their respective officers. Mr. Ameye (Belgium) was appointed Chairman of the working party on economic problems and Mr. Eckel (Germany) Chairman of the working party on social, health and training questions.

V. The Scientific and Technical Committee

93. The Scientific and Technical Committee held three meetings in 1966, namely, on 15 February, 1 July and 26 September.

At its February meeting, the Committee appointed Mr. Baron, head of the "Atomic Applications" division of the P echiney company, to be its Chairman and Mr. Cacciapuoti, head of the Institute of Physics at Pisa University, its Vice-Chairman for the current year. It then began consideration of a series of problems which were to occupy it throughout the year and which in fact reflect, in the sphere of nuclear power generation, the main lines of Community planning for the next ten or twenty years. These problems concern in particular the draft target programme of nuclear energy production drawn up by the Commission for the period 1965-80 and the technical and industrial development strategy to be adopted.

An *ad hoc* sub-committee set up on the prompting of the Scientific and Technical Committee and consisting of top-level representatives of Euratom's associations and representatives of industry, together with members of the STC, embarked upon a detailed investigation of the state of progress in fast-breeder development work in the Community and elsewhere.

As regards nuclear energy development forecasts and strategy for Community industry, the Committee concurred in the Commission's fixing upon the price of energy and the reliability of supplies as the fundamental criteria. It also expressed its satisfaction with the studies undertaken by the Commission, and more particularly the fact that they tend to show that progress from proven-type to fast reactors by way of advanced converters constitutes the best strategy for the Six.

The Committee had before it on 1 July a first comparative rundown on heavy-water reactor designs, prepared by Euratom personnel. The survey indicated the advantage of the heavy-water organic reactor family (ORGEL project) developed by the Community over competing reactor types from the standpoint of the cost per kWh at the reference capacities adopted and the significant technical data and from the angle of industrial policy.

Basing their opinion on the figures supplied, some members of the Committee advocated the speedy construction of an ORGEL prototype optimized

for enriched uranium which could operate in the form of a joint enterprise as defined by the Treaty. Other members considered that any decision on a heavy-water prototype should be held over until they were in possession of adequate data relating to all intermediate-type reactors irrespective of family and to the subsequent development potential of the proven-type families. The Commission undertook to obtain such additional data, drawing largely on firms responsible for promoting the projects so as to avoid any legal wrangles.

Meanwhile, however, the Committee decided to give its backing to a number of activities proposed by the Executive, notably the development, through organized competitions, of detailed design studies involving tenders for the construction of an ORGEL prototype power plant, the determination of ways and means of financing its construction, and the development of a reference project for an industrial-series 500 MWe power plant.

At the same meeting, the Committee noted and endorsed the conclusions of the *ad hoc* sub-committee set up on its initiative to enquire into actual needs and openings for cooperation in the fast reactor field. The sub-committee had been unanimous in advocating the continuance of Euratom's activities in this entire field and action by the Executive to encourage industrial agreements on a broad Community basis.

At its meeting on 26 September, the Committee took cognizance of the preliminary draft research and investment budget for 1967, noting that the Commission had barely any freedom of manoeuvre in respect of this final year of the five-year programme.

Apart from these leading problems, the Committee signified approval of the extension of the DRAGON agreement after its expiry in April 1967 until the end of the five-year programme.

VI. Consultative Committee on Nuclear Research

94. The Consultative Committee on Nuclear Research met in Brussels on 16 September 1966.

As in previous years, it examined the documentation passed to it by the Commission, which the latter proposed to take as a basis for preparing the preliminary draft research and investment budget for the financial year 1967.

This was followed by a brief exchange of views regarding the procedure to be employed in drawing up the third research and training programme. A statement had come from the Commission setting out the broad lines of the Community's future activities, particularly in the sphere of research, and inviting comments from delegations.

VII. The Joint Services

1. *The Joint Information Service*

95. In accordance with the general directives laid down in 1963 in the "Memorandum on the Communities' information policy" and within the limits permitted by a budget only 3.2% up on the previous year, the Supervisory Board of the Joint Information Service had approved a detailed programme for 1966 and this was, in the main, carried out according to plan.

The principal activities are summarized below, under the headings of "Media" and "Special Audiences".

Media

Priority was again accorded to *publications*, the list being headed by the six general news periodicals, the circulation of which was in general held down on grounds of economy although quality was further improved (new features, layout, correspondents, studies and statistics). The bulletin in Spanish for Latin America continued to flourish. The supplements in French and English for Africa seem to have scored a great success in the countries associated with the Community; since the beginning of 1967, they have been incorporated in the regular French and English editions and forwarded to all European and African recipients of the two periodicals.

In addition, the Joint Service in 1966 issued 76 booklets in nine languages, totalling about 1,100,000 copies, as well as six folders (375,000 copies) and two maps (60,000 copies).

To meet growing public demand, the press and information office libraries in Bonn, Paris, Rome, London and Washington, the libraries of the Community documentation centres in Athens and Dublin and the Brussels library have stepped up their activities, notably as regards documentation in the strict sense. Furthermore, relations have been opened up in Turkey with two new documentation centres, at Ankara and Istanbul respectively.

Turning to *audiovisual media*, cooperation with the television networks of the six Member States continued, although it was not possible to reach formal agreement on joint broadcasts. On the other hand, representatives of the various networks participated in the planning of a number of films made on the initiative of the Joint Information Service and several have agreed to run them on their screens.

Cooperation of another kind with broadcasting and television networks, one which has proved especially fruitful, consists in welcoming and technically assisting freelance teams coming to report on Community affairs.

Ever eager to obtain the skilled advice of experts, whether in the making or the distribution of films, the Joint Service organized a meeting, in December 1966, of an expert committee on the cinema in Europe. Cooperation was also strengthened with groups producing documentaries and with newsreel services.

Lastly, in order to profit from the combined activities of the major manufacturers of photographic and cinematographic equipment as regards training the rising generation in this field, a second European competition was held in which twenty thousand young people from the six Member States and the two European associated countries took part.

There was relatively little active participation in *fairs and exhibitions* in 1966, on account of preparations for the European Community's pavilion at the Montreal Universal and International Exhibition of 1967. However, the Italian mobile exhibition was present at five regional events and in France a small stand was set up at the Romans (Drôme) fair in September at the request of the municipality. In the Netherlands, two exhibitions for school children continued to tour the country and a third was organized. Two events were arranged in Brussels and a travelling exhibition on European integration is visiting Belgian schools with the backing of the Education Ministry. Material for exhibition has been supplied to various organizations in Germany, Britain and the United States.

Last but certainly not least there was the imposing Euratom stand at "Nuclex 66" in Basle in September 1966.

Special Audiences

The information activities described above are aimed at a very extensive and, in many cases, extremely mixed public.

The Joint Service is also engaged in what may be termed information in depth, angled at special audiences which perform a particularly important role in the process of European integration.

For *labour circles*, 52 courses were arranged in Brussels and Luxembourg and were attended by some 1500 labour leaders in all, while 200 seminars were held in Member States of the Community; altogether, around 12,000 trade unionists took part in these various events. Moreover, most trade union training centres or colleges include Community questions in their curricula. Over and above this, a panel of trade union lecturers serve a decentralized information network for local audiences (275 lectures to some 14,000 organized workers in 195 different places).

The year 1966 also saw an outstanding achievement in the teach-in on "Income policy in Europe" organized on the combined initiative of the Joint Service, the ICCTU and Louvain University. Following the success of this

venture, the Joint Service is looking into the possibilities of arranging similar events with the participation of other higher education establishments and labour organizations.

Also worthy of note is the regular publication of labour news bulletins, a review of the trade union press and a calendar of trade union meetings, and, for the United States, a special bulletin issued by the Washington Office.

Activity in *university quarters* and in connection with *youth and adult education organizations* is more and more in evidence as a major feature of information policy.

As to other organized groups, contacts are extended daily through the offices of the Joint Information Service in the six Member States and in Britain, Switzerland, the United States and Latin America; this is in addition to the visits to Brussels and Luxembourg by leaders and organizers of all kinds of bodies (nearly 10,000 people in 300 parties during 1966).

In the *Associated African States and Madagascar*, a continuous flow of information is channelled to the press, radio, television and film circuits, as well as that conveyed directly to the quarters interested in the problems of the association and in the operations of the European Development Fund. Conversely, information on the associated countries is disseminated in Europe. In fact, the division of the Joint Service in Brussels responsible for dealing with these questions has a threefold function, in the same way as an external office: that of an enquiry office replying to the most varied questions from the public, of a documentation bureau supplying the public with documents as called for, and of an information office issuing posters and leaflets, providing material for fairs, exhibitions, symposia, etc. Only the fact that there are limits to the funds at its disposal prevents this many-sided activity, so important in backing up Africa's association with Europe, from being extended still further.

2. *The Statistical Office of the European Communities (SOEC)*

96. During the period under review, the Statistical Office furnished the Executives and the general public with a large volume of basic statistics. Surveys were organized and carried out in a number of sectors and the findings evaluated, while further progress was achieved in work on nomenclatures and standardization in many fields.

The *Supervisory Board* of the Office met several times, dealing mainly with budgetary matters and the reshaping of the organization plan.

The *Conference of Heads of National Statistics Offices* concerned itself chiefly with the progress of social statistics surveys for 1966, the survey on the structure of agriculture, the working programme for 1968 and topical questions relating to the development of common industrial statistics.

In respect of *demographic statistics*, the Office examined the problems raised by the standardization of population and housing censuses.

A special booklet on *national accounting* figures for 1966 gives a vast amount of statistical data on the Member States individually plus tables for the EEC as a whole, the United Kingdom and the USA.

Outstanding work was done on the methods used in breaking down national accounting statistics. The Office also took an active part in discussions on the revision of the United Nations system of national accounting under the aegis of the Economic Commission for Europe (UN/ECE) at Geneva.

An overall survey was produced on *financial accounting* methods. A survey on the consolidated balance-sheet of credit institutions is at the project stage, while a study on the balance-sheets of manufacturing concerns is in progress. In addition, various monographs have been prepared on methodological questions relating to the Member States' balances of payments.

In the context of its *input-output studies*, the Statistical Office published in No. 9 of the "Bulletin Statistique" a table covering the European Community as a whole. This input-output table, like the national tables used in compiling it, relates to the year 1959 and covers 37 branches of production; the working group in charge will next compile the tables for 1965.

As to *energy statistics*, the specimen energy balance-sheet was enlarged, principally in relation to the industrial sector. Certain basic data on Community crude oil supplies were published in "Informations Statistiques" and new questionnaires were drawn up in respect of coal statistics.

A booklet containing general statistics on the associated States and associated countries and territories was published.

The important item to note in the field of *external trade statistics*, apart from the numerous documents furnished for the Kennedy Round negotiations and other purposes, is that the standard external trade nomenclature known as NIMEXE (European import-export nomenclature) came into force in 1966. Discussions continued on questions of intra-Community trade statistics after the abolition of customs barriers.

The main feature in the *transport statistics* programme consisted in work in connection with the survey of infrastructure costs.

Foremost under the heading of *industrial statistics* were the discussions of a fundamental nature with the competent directorates-general, UNICE and certain national bodies concerning the establishment and development of a coherent system of surveys. Further work was also done on the common nomenclature of industrial products on which production statistics will in future be based. Lastly, the 1963 industrial census figures were received from Member States for evaluation.

As regards *social statistics*, Regulations Nos. 100 (survey of wages in the road transport sector) and 101 (survey of wages in industry) are of outstanding importance. Much of the work in the field of social statistics was concerned with the joint index referred to in Article 65 of the Service Regulations. As a preliminary to detailed surveys on accidents at work in the Community, a pilot survey was made in the paper industry. Results of the family budget survey were published for several countries.

3. *The Joint Legal Service*

97. There is nothing special to report with regard to organizational changes or liaison between the three branches of the Legal Service, which continued to cooperate closely in all matters of common interest.

As regards the Euratom branch specifically, the Legal Service fulfilled its duty of formulating and preparing the legal arguments for the Commission's official instruments and its proposals to the Council.

At the same time, counsel attached to the Legal Service again represented the Commission's interests and defended its decisions before the Court of Justice of the European Communities. The Court of Justice had occasion to pronounce on major points of administrative law, in particular in respect of disciplinary measures and the rights and duties of the authority empowered to make appointments consequent on a competitive examination organized for the purpose of building up a reserve.

The Legal Service likewise represented the Commission in a dispute between the Community and the UK Atomic Energy Authority, which, following a compromise with the British Government, was referred to arbitration, which in turn resulted in the Commission winning its case.

Once more the Legal Service took an active part in conferences and meetings on questions of jurisprudence or designed to make the main aspects of Community law more widely known.

VIII. Interexecutive Cooperation on Research

98. The interexecutive working group set up in October 1965 to study problems of scientific and technical research in the Community held three meetings during the period covered by this report. In September 1966, Mr. Carrelli, Vice-President of the Euratom Commission, succeeded Mr. De Groote as Chairman of the group, other members of which are Mr. Marjolin for the EEC Commission and Mr. Hettlage for the High Authority of the ECSC.

The working group applied itself to laying down guide-lines for the formulation of a joint policy on scientific and technical research. There were also far-reaching discussions on the widening gap between the Community and the big economic blocs in matters of advanced technology.

At departmental level, ideas and viewpoints were compared at four meetings of the *ad hoc* committee during the course of the year. This *ad hoc* committee, while preparing the ground for the meetings of the interexecutive working group, endeavoured to reconcile the standpoints of the three Executives with an eye to the meetings of the Medium-Term Economic Policy Committee's working party on scientific and technical research policy. The three Executives, it will be remembered, are represented in equal numbers by delegates to this working party.

With their long experience of joint research, the relevant departments of Euratom were able to make a realistic contribution to the working group's achievements; specifically, two searching studies, one on selective intervention techniques in the field of scientific research and the other on the mechanization of scientific and technical information services, were presented on their initiative.

These studies will serve as basic material for the Maréchal working party, which is due to report to the Medium-Term Economic Policy Committee in about two months' time.

Its report will be in three chapters, namely:

- 1) General conditions for the encouragement of research and new ideas.
- 2) Selective measures to promote research and new ideas.
- 3) Problems of and opportunities for cooperation between Member States in specific fields.

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