EURATOM

a year of activity

•

april 1960
april 1961

Based on the Fourth General Report
of the Commission of the
European Atomic Energy Community

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a year of activity

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NUCLEAR

I. GENERALITIES

One of the tasks of the Euratom Commission is to promote, facilitate and coordinate nuclear research in the six countries of the Community so that the problems remaining before nuclear energy becomes competitive can be overcome. It does this on its own responsibility through collaboration with the relevant bodies in the member states and in consultation with the Scientific and Technical Committee, which is consulted on all important aspects of Euratom's work.

Opportunities must be provided for scientists in Europe to master the latest techniques and for manufacturers to experiment with full-scale reactors of the most promising types.

For this purpose, Euratom has at its disposal a $ 215 million research budget, which will have been largely allotted by the end of the five-year period (end 1962) scheduled by the Treaty.

The Euratom research programme is three-pronged, covering the application of radiation and radioisotopes, controlled thermonuclear reactions and reactor studies.

II. MEANS AVAILABLE

— Joint Research Centre establishments
— Contracts
— International contracts and agreements for co-operation.

The setting-up of the establishments of the Common Research Centre and the consolidation of the links with national research organizations and industry are enabling the Community to make up for lost time.

JOINT RESEARCH CENTRE AND BRANCH ESTABLISHMENTS

The setting-up of the establishments of the Joint Research Centre in existing research centres enables expenses to be cut to a minimum and current research work to be stimulated and completed.

ISPRA

This is a general-purpose research centre. The first European teams of research-workers had already moved to Ispra by September 1960. As of March 1961, the sole responsibility for the Centre is vested in Euratom, apart from the Ispra I reactor and its ancillary laboratory.

The staff at present numbers 800, plus the 150 Italian personnel still working there. The construction and equipment of new laboratories and installations is at present the main preoccupation at the Centre. The first operations of the experimental neutron physics group will be devoted to the building of a slow chopper. Soon work will start on the ORGEL-type reactor string. A Computer Centre will also be functioning there.

By the end of 1962 1,500 research-workers will be employed at Ispra, and it is planned to spend $ 40 million on the development and operation of the installations there.

RESEARCH

THE CENTRAL NUCLEAR MEASUREMENTS BUREAU (CNMB)

The Central Nuclear Measurements Bureau has been set up to advance the science of physical measurements. This involves research on the improvement, conservation and distribution of standards, as well as the development of appropriate methods and instrumentation. Measurements are already being carried out. It has been decided to equip this Bureau with a 3 million electron-volt linear accelerator and a mass spectrograph. The Bureau works in liaison with various international organizations, in particular the European-American Nuclear Data Committee (in collaboration with the member countries of the European Nuclear Energy Agency), the International Bureau of Weights and Measures and the International Commission for Radiological Units and Measurements.

KARLSRUHE: THE EUROPEAN TRANSURANIUM INSTITUTE

On 21 December 1960 an agreement was signed with the Karlsruhe **Gesellschaft für Kernforschung mbH.** for the establishment and operation of an Institute for the Study of Transuranium Elements. This Institute will be the centre for joint research on the peaceful use of transuranium elements, of which the most important is plutonium. An agreement has also been concluded with the Land Baden-Württemberg concerning the use of the site.
One of the main tasks of the Institute will be to study plutonium fuel elements.

PETTEN

Negotiations between the Commission and the Netherlands Government for the setting-up of a new Joint Research Centre branch establishment at Petten are likely to be concluded shortly. This will be a general-purpose centre, although at the outset its programmes will be centred on the use of its modern and powerful high-flux reactor.

INTERNATIONAL AGREEMENTS AND MEETINGS

In drawing up and carrying out its research programmes, Euratom has taken full account of the opinions of all interested parties : a large number of round-table discussions have been held, in particular with the US authorities, with Canada (Chalk River), with the UK (Bournemouth and Risley) and at Brussels, Rome, Ispra, Majorca, etc.

Work under the agreements for international co-operation (see « External Relations ») has gone ahead and a number of important meetings have been held with the authorities in charge of national research programmes in the Community, in particular those held at Brussels in December 1959, at Baden-Baden in February 1959 and at Royaumont in September 1960 A Committee has been set up to extend the scope of these meetings.

CONTRACTS

Euratom's research efforts are not concentrated entirely on work at its own establishments; it also operates through contracts concluded on specific subjects with national and international public or private bodies.

A large number of these contracts are being concluded under the United States / Euratom Agreement. Each of them is designed to stimulate research work in the Community.

Ninety-four contracts involving a sum of some $ 90 million have been concluded to date and 150 research-workers from the Community are engaged in the work covered by them.

35 contracts have been signed under the United States / Euratom joint research and development programme, fifteen under the Orgel programme, and another fifteen or so for the Scientific Information Processing Centre. The other contracts relate to equipment for the Ispra Research Centre, mineralogy, fast reactors and work on behalf of the Central Nuclear Measurements Bureau.

CONTRACTS OF ASSOCIATION

Contracts of Association generally cover a wide area of research and require a substantial financial and technical investment. They have three main features :

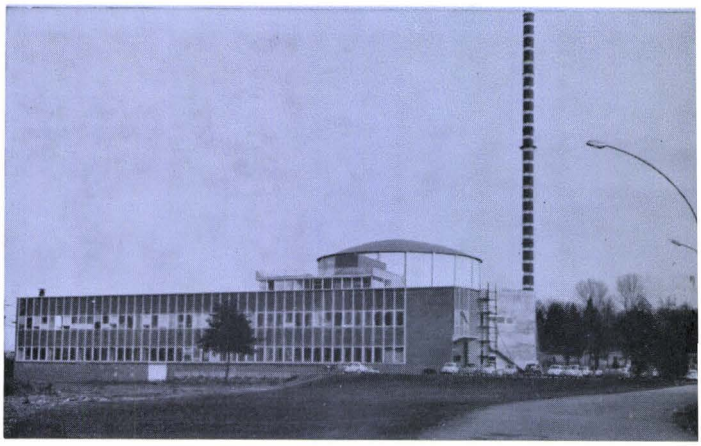
1. Euratom participation in the financing and general management of the contract;
2. Seconding by Euratom of scientists from the Community countries to work under the contract;
3. Performance of various services by the contract-holder (by the provision of technical aid or scientific equipment, in particular as regards the exchange of information).

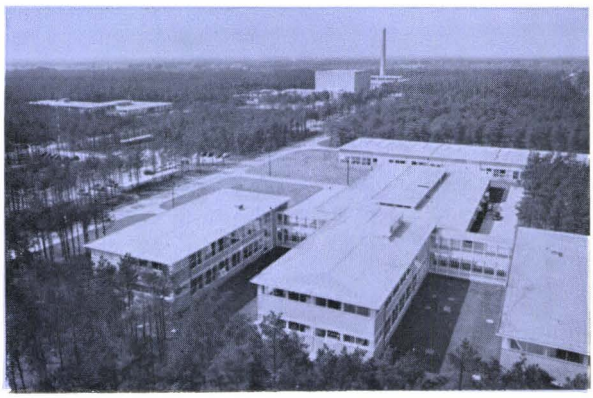
Eight contracts of association have been or are in operation.

ORGANIZATION	DURATION OF CONTRACT	PURPOSE
Centre d'étude de l'énergie nucléaire	2 years	Cross-section measurements
Centre d'étude de l'énergie nucléaire	20 years	Joint operation of the BR2 high neutron-flux materials testing reactor
Commissariat à l'Energie Atomique	3 years	Research at the Fontenay-aux-Roses Centre into controlled thermonuclear reactions
Comitato Nazionale per l'Energia Nucleare	2 years	Frascati Research Centre: controlled thermonuclear reactions
Comitato Nazionale per l'Energia Nucleare	3 years	Research on low-energy nuclear phenomena
K.E.M.A. Arnhem	3 years	Construction of a 250 kW reactor experiment known as the Suspop project — a homogeneous suspension reactor
T.N.O. The Hague	3 years	Radiation sickness therapy—breeding and use of pathogen-free animals
ITAL Wageningen	20 years	and the soil and the study of isotopes in plants, animals The genetic effects of irradiation on plants, the preservation of foodstuffs by irradiation
Institut für Plasmaphysik (Max Planck-Gesellschaft) Münich	3 years	Controlled thermonuclear reactions.

ISPRA

Establishment of the Common Research Centre near the Lago Maggiore, some 36 miles from Milan. Will employ 1,500 research-workers by the end of 1962. - Facilities already available cover 12,500 square metres and will cover 48,000 sq. metres by the end of 1962.





MOL

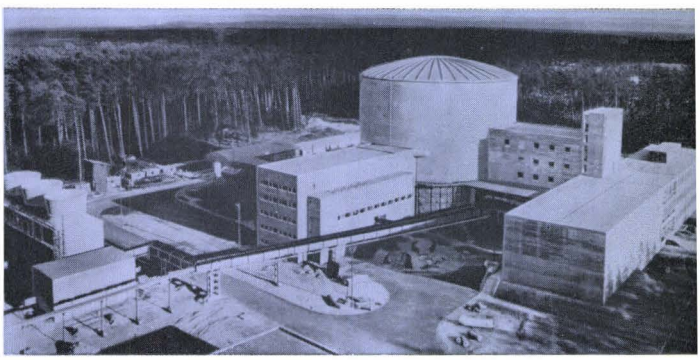
(Central Nuclear Measurements Bureau)

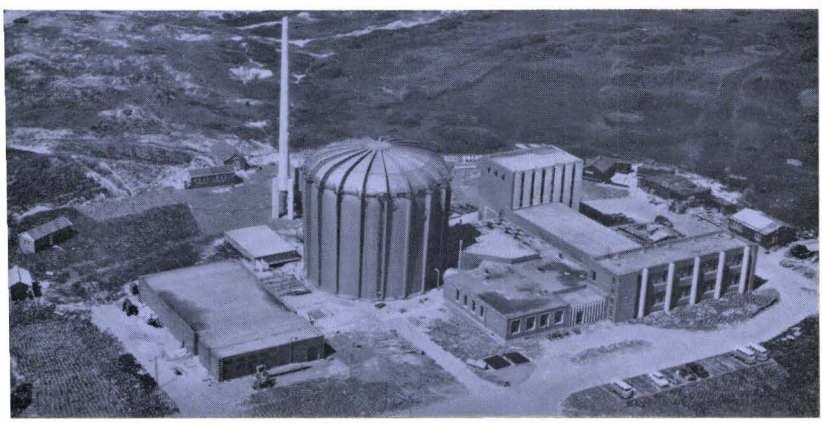
Present staff 60, 24 of whom are scientists. Will be increased to 90 by the end of 1961.

KARLSRUHE

(Transuranium Elements Institute)

In the course of 1961, a staff of 45, 15 of whom university-trained scientists, will form the nucleus of the initial research team. The staff will subsequently total 400.
(Photo of the existing Centre on opposite page.)





PETTEN

Some hundreds of Euratom research-workers will be employed at Petten.

III. EXECUTION OF THE COMMON RESEARCH PROGRAMME

1960 was devoted to the setting-up of the establishments of the Research Centre and to the drawing-up of the research programmes. During the year the first scientific publications have appeared, and the first patents been filed.

I. LIAISON WITH THE NATIONAL ORGANISATIONS

Having listed and summarized all national programmes, the Commission has embarked on a survey of research projects, concentrating on nuclear biology and radioisotopes.

The work in the field of high flux reactors and the setting up of essential laboratory equipment is being co-ordinated.

II. APPLICATION OF RADIATION AND RADIOISOTOPES

A. PRODUCTION OF RADIOISOTOPES AND LABELLED MOLECULES

One of the Commissions's tasks is to coordinate the production, treatment and distribution of radioisotopes and the exercising of the relevant controls and safeguards, as well as the development of their field of application.

An association project is planned in conjunction with other institutions and enterprises operating in this field. Brochures and films will be distributed to publicize the uses of radioisotopes for the benefit of potential users.

An information service has been set up to advise industry.

B. BIOLOGY

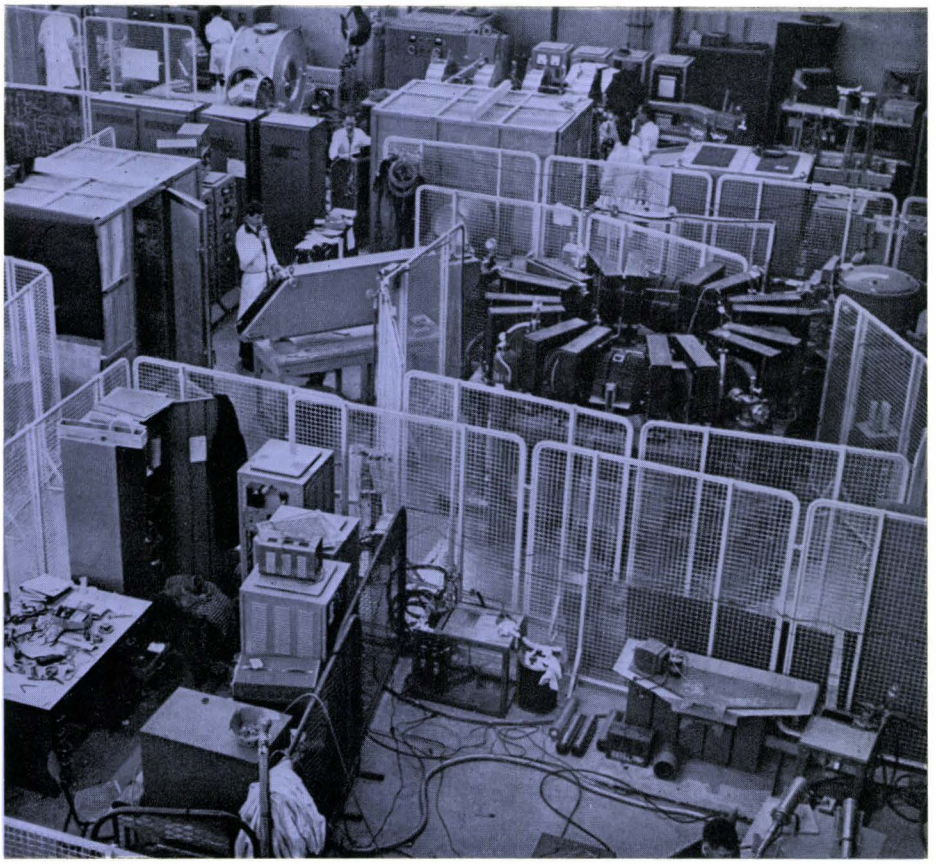
A contract concluded with the Nederlandse Centrale Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek (T.N.O.) has already yielded results as regards the breeding of specific pathogen-free animals and the treatment of radiation sickness.

An important contract has been concluded with the Dutch Instituut voor Toepassing van Atoomenergie in de Landbouw (I.T.A.L.); it provides for the study and development of methods and techniques employed in carrying out research into the genetic and somatic effects of irradiation in plants, the conservation of foodstuffs and the agricultural use of isotopes.

III. CONTROLLED THERMONUCLEAR CONTRACTS (Fusion)

The contract signed with the French Commissariat à l'Energie Atomique is to be extended beyond its last year, 1962. The work under this contract under way at Fontenay-aux-Roses is going ahead and has already resulted in a number of patents being filed.

At the end of 1960 a sub-contract was placed with the Italian C.N.E.N. for the study of special problems at Frascati.



At Fontenay-aux-Roses, the work is principally concentrated on the study and manufacture of magnetic mirrors. Two models are being constructed and tested.

A second such contract has been signed with the Institut für Plasmaphysik at Munich and another is scheduled with the German research centre at Jülich. Exchanges of information have taken place with the British authorities.

IV. REACTORS AND ASSOCIATED STUDIES

The Commission's main efforts are being concentrated on the Orgel type reactor. But, through the various agreements and contracts, the following other types have been studied and developed :

1. — Gas-cooled reactors (Dragon and HPGR)
2. — Heavy boiling water reactors (Halden)
3. — Light water reactors (U.S. Agreement)
4. — Fast reactors
5. — Homogeneous and suspension reactors (KEMA)

The Commission is also participating in the direction of experimental reactors (BR2, Ispra and, soon, Petten).

1. GRAPHITE-MODERATED REACTORS

[illegible]

Work on this project has entered a phase of intense activity. The construction of the reactor started in April 1960 and it will be completed at the beginning of 1963. This is an O.E.E.C.-project in which Euratom represents the six Community countries.

21 Euratom engineers and research-workers from the Commission are at present working at Winfrith Heath (UK).

Some of the equipment and material required for this reactor have been supplied by Community firms. The work undertaken so far has already yielded a substantial amount of information.

HIGH PERFORMANCE GAS-COOLED REACTOR

The Commission has been in contact with the French Atomic Energy Commission for the study of applications of this reactor system for power production. It is proposed to construct a reactor experiment (HPGR). Plutonium re-cycling will feature in the programme.

2. HEAVY WATER-MODERATED REACTOR SYSTEM

EUROSEN (heavy water)

This is also an O.E.E.C. project. In June 1960, the signatories of the Halden agreement decided to extend the joint research period for 18 months beyond the 3 years originally provided for.

Euratom has added around $ 600,000 to the original appropriation. The first operational trials were carried out in October 1960. Eight Community specialists were engaged on the project out of the 39 working there.

ORGEL PROJECT

The Orgel project consists of the studies necessary for the development of heavy water-moderated and liquid organic-cooled type reactor, which appears to be promising for European requirements.

The research programme will include the execution of practical assignments.

The development of the programme involves the construction of a specific reactor (Essor), a project that has been put in the hands of two industrial study groups which combine the efforts of various industrial research bodies in the Community.

The research programme in general is being put into operation both in the Ispra Common Research Centre and under contracts, of which 15 are under way and which bear on irradiation, heat transfer, metallurgy, technology, chemistry and physics.

The Canadians are going ahead with similar studies, while useful exchanges of information have taken place in this field within the framework of the Euratom-Canada Agreement.

3. LIGHT WATER REACTORS

The research and development programme of the US / Euratom Agreement is aimed at improving the reactors constructed in Europe under the Agreement and developing the plutonium cycle. The Euratom Commission has obtained the agreement of the US authorities for the extension of the scope of the common research programme to all research projects theoretically relevant to pressurized water reactors, the type being built by the SENN company.

Fuels irradiated in a nuclear reactor contain fissile materials which, after treatment, can be used again. This treatment consists essentially of separating fissile materials like uranium 235 or plutonium from the fission products, which are regarded as waste, in such a way that the fissile materials can be re-employed. Studies are now in course to perfect physico-chemical or metallurgical treatment techniques with the aim of achieving a better yield from the fuel cycle.

4. FAST REACTORS

The Commission's research cooperation on this advanced type reactor system which can be used for fuel breeding is being undertaken in co-operation with France (Rapsodie reactor) and Germany (the Karlsruhe Group). A contract has been signed with the Belgian Bureau d'Etudes in the field of neutron physics.

5. HOMOGENEOUS REACTOR

Work has continued under the contract which is being implemented in association with the Dutch firm of KEMA (N.V. tot Keuring van Electrotechnische Materialen). This SUSPOP project, as it is called, involves the construction of a 250 kW homogeneous suspension reactor experiment.

The scope of this research project has been widened thanks to contacts with the Saclay Nuclear Research Centre, the Harwell Research Establishment and the Oak Ridge National Laboratory and various firms in the Community.

Associated studies.

MATERIAL'S TESTING REACTOR

The BR2 Agreement, signed in June 1960, provides for joint operation of the fast high-flux BR2 reactor at Mol. The 140 strong team includes 30 members of Euratom's staff. The reactor is expected to go critical in summer 1961, when 200 people will be working on the reactor. The setting up of an establishment at [illegible] will be useful in developing this project.

RESEARCH PROGRAMME ON TRANSURANIUM AND TRANSPLUTONIUM ELEMENTS

The Institute for Transuranium Elements at Karlsruhe is intended to study plutonium-based fuel elements, which appear to have a particularly interesting future.

Parallel with the development of this programme and with the research taking place within the framework of the Euratom-US Agreement, two contracts will soon be concluded with the Belgian Centre d'études de l'énergie nucléaire, one concerning the production of transplutonium elements, using the BR 2 reactor, the second studies bearing on the production of plutonium in general.

Negotiations are under way with the French C.E.A. (Commissiariat à l'énergie atomique).

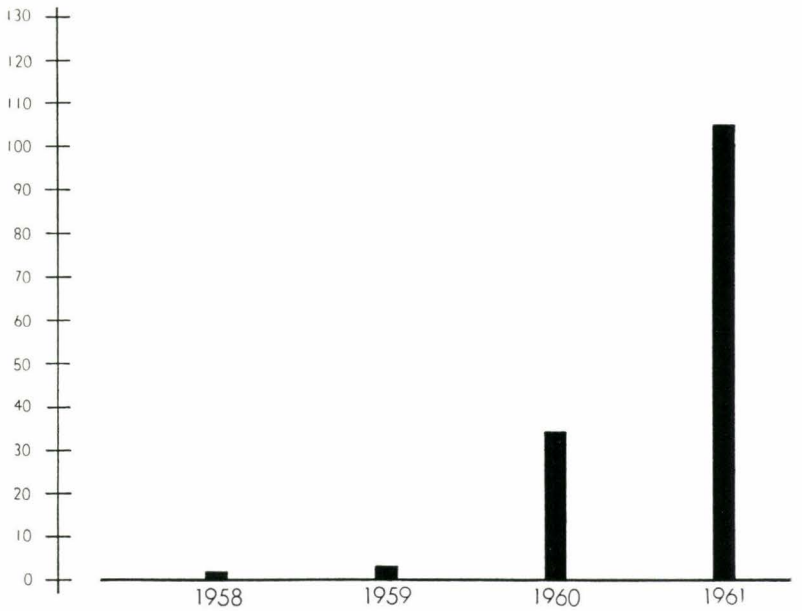
MINERALOGY AND GEOCHEMISTRY

The Euratom programme covers the use and development of investigation techniques for mineral research.

A research team is being formed. Deep ice core-samples have been taken at the King Baudouin base at the South Pole and will be studied in Europe.

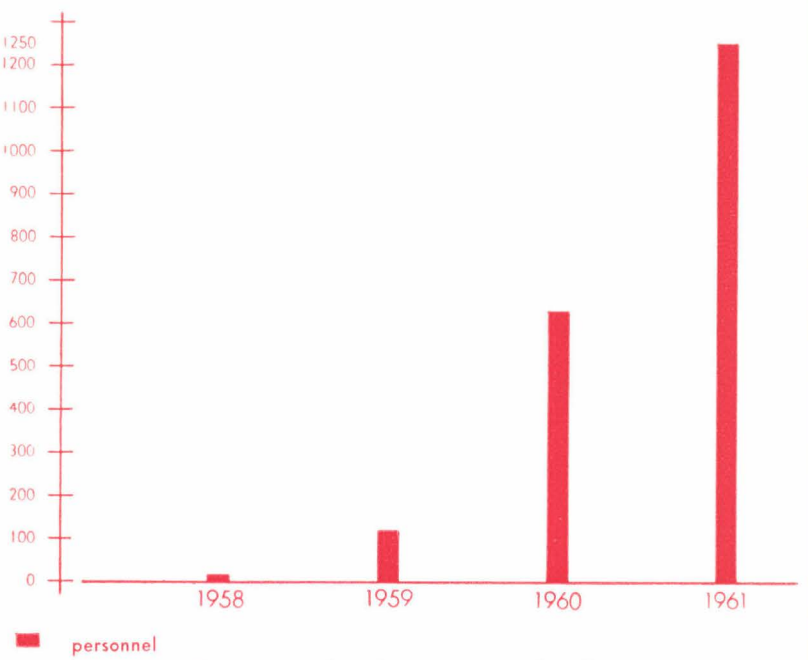
NUCLEAR PHYSICS

A three-year contract of association has been concluded with the Italian C.N.E.N. for research on low energy physics.



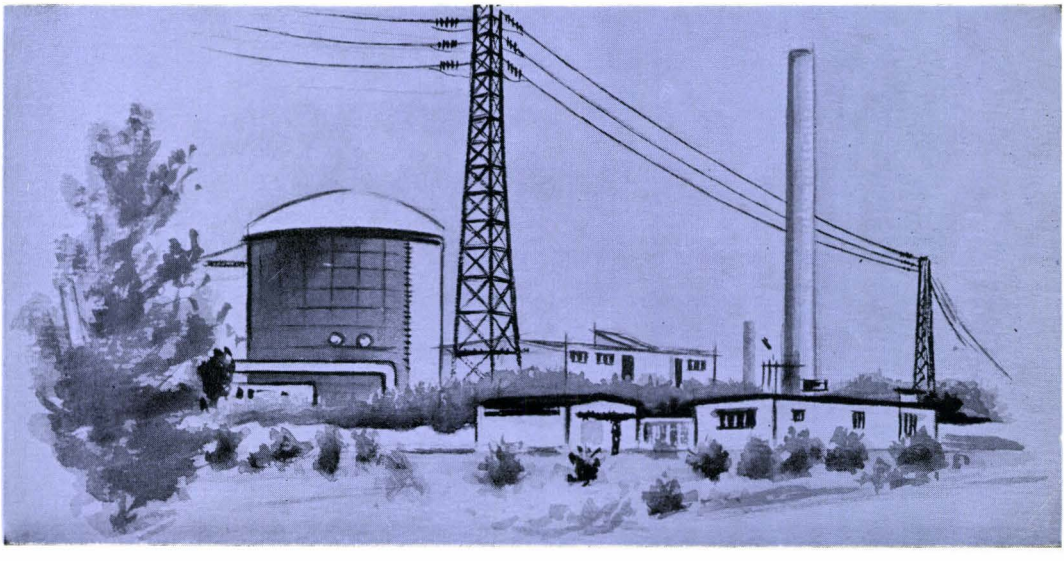
EMA units of account (dollars)

Development of the Euratom research budget.

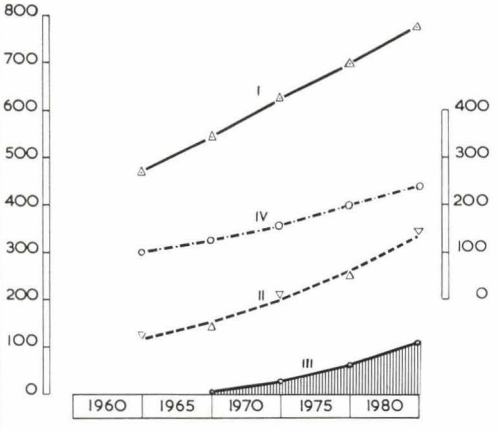


The rising number of Euratom research staff.

A lengthy period of preparation is required for nuclear energy to become competitive. This preparation requires both nuclear and industrial experience of the use of nuclear energy.



INDUSTRY



I Primary energy requirements in millions of tons coal equivalent

II Primary electricity requirements in millions of tons coal equivalent

III Electricity requirements which can be furnished by nuclear energy, in millions of tons coal equivalent

IV Industrial production index

In view of the continual rise in energy requirements, nuclear power will become essential.

In twenty years time the Community's electricity requirements will have quadrupled, and nuclear power will be required to produce a quarter of the electricity required. This represents as much electricity as is produced today in the six countries.

In 1961 the cost of nuclear is still considerably above that of conventional power. Nuclear power must be made competitive as soon as possible.

The studies in which the Commission has been engaged confirm the forecasts made a year ago : nuclear power will become competitive with conventional power around 1970. This depends on

— the industries concerned mastering the problems concerned with the manufacture of reactor fuel elements

— the designers and engineers becoming familiar with all the problems linked to the construction of power stations

— new branches of industry being created or developed to provide the necessary nuclear equipment

— the operators of the power plants acquiring the necessary experience

— the formation of specialised working groups.

The construction of large-scale power stations is essential if experience is to be gained of the technical problems which are likely to be encountered in the nuclear industry of the future. The experience of small-scale prototype plants may be misleading.

AND ECONOMY

POWER PROJECTS UNDER CONSTRUCTION OR PLANNED

Date	Reactor		Type	Net Power (MWe)	Total Power at End of Year (MWe)
1960	Marcoule (France)	G1	Air-cooled, Plutonium-producing reactors, graphite-moderated, natural uranium	6	
		G2	CO_2-cooled	30	
		G3	CO_2-cooled	30	
(already operational)	Kahl (Germany)		Boiling water - enriched uranium	15	80
1961	Mol (Belgium)	BR3	Pressurized water - enriched uranium	12	
	Chinon (France)	EDF1	CO_2-cooled - graphite-moderated - natural uranium	60	152
1962	Chinon (France)	EDF2	as EDF1	170-200	
	Latina (Italy)	SIMEA	Gas-cooled - graphite-moderated - natural uranium	200	522-552
1963	Garigliano (Italy)	SENN	Boiling water - enriched uranium	150-230	687-717
	Jülich (Germany)	AVR	Gas-cooled - graphite-moderated	15	
1965	Chinon (France)	EDF3	as EDF1	300-500	
	Chooz (France)	SENA	Pressurized water - enriched uranium	242	
	Monts d'Arrée (France)	EL4	CO_2-cooled - heavy water-moderated - natural uranium	100	1327-1557

Mention should also be made of a plan of the Kernkraftwerk Baden-Württemberg Planungsgesellschaft (KBWP) to build an OMR-type reactor. The BEWAG company of Berlin is studying a project for a 150 MW reactor, while the EDF 4 (300 MW) project is awaiting a definite decision. In addition, a 150 MW PWR-type reactor is planned by the Italian SELNI Company.

The **power reactor programme** provided for under the Euratom/US Agreement is being followed through. The decision of the Società Elettronucleare Nazionale (SENN) to build a nuclear power plant working on a boiling water reactor on the river Garigliano has already been made public. This plant is scheduled for commissioning in June 1963 and will have an initial power of 150 MW. SENN and Euratom are contemplating the possibility of stepping up the power of the plant from 150 to 230 MW. The Société d'énergie franco-belge des Ardennes (SENA) constituted on 24 May 1960 by French (EDF) and Belgian (Centre et Sud) producers plans to put up a power plant using a 242 MW PWR-type reactor; this will be one of the biggest plants in the world employing light water. Scheduled commissioning date : 1965.

SUPPORT FOR POWER STATION CONSTRUCTION

— So far, concrete achievements in the industrial field are insufficient. For this reason the Commission has embarked on various actions designed to increase and diversify the projects in member countries and to arouse the interest of industrialists and power producers by giving wide access to the knowledge and experience acquired.

With this in mind, and in view of experience and technical information which can be obtained in return, it is planned to encourage the launching of new projects by participation in the cost of manufacture of fuel elements, by providing fuel, by contributing to the cost of reactor construction, or by underwriting the extra costs entailed by the special difficulties involved in the start-up period of nuclear power stations, difficulties which are not undergone in conventional power stations.

Three requests for this form of Community participation have so far been made by the SENN, SENA and SIMEA (Società Italiana Meridionale dell'Energia Atomica) companies. The Council of Ministers will be taking a decision on the Commission proposal.

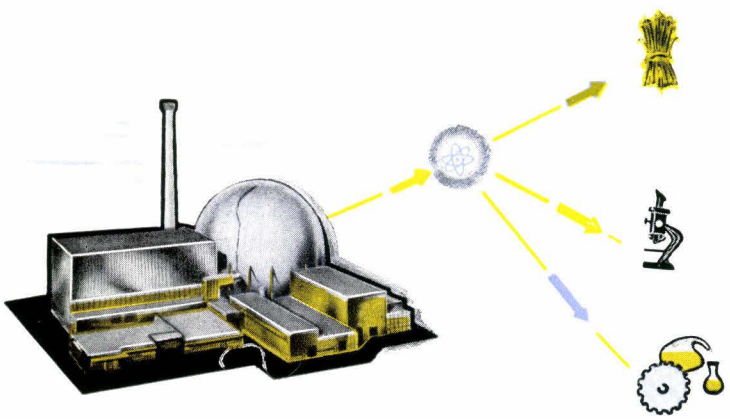
— **The nuclear common market** (the free circulation of nuclear materials in the Community) has come into effect. A decision is also soon due from the Council of Ministers on the Commission's proposals, on which the European Parliamentary Assembly is being consulted, for the free circulation of nuclear specialists.

— The statute of **Joint Enterprise** has been granted to the SENA company, which is to build a power station at Chooz near the Franco-Belgian frontier.

— The problem of **civil responsibility** and coverage for nuclear risks is on the way to solution. The Commission, having participated in the elaboration of the OEEC convention, has drawn up an additional convention designed to make individual states responsible for coverage of up to $ 70 million for accidents occurring on their territory, and to make the contracting states collectively responsible for additional amounts up to a maximum of $ 110 to 120 million. It is hoped that the convention will be signed in the course of 1961. This development would provide a strong impetus to the growth of the Community's nuclear industry.

Alongside these power production projects, Euratom is devoting considerable attention to the application of radioisotopes and the development of nuclear propulsion units for merchant shipping.

RADIOISOTOPES



An inquest made in 1958 has revealed that the use of radioisotopes in industrial production resulted in savings of $ 500 million in the USA and $ 11 ¼ million in the UK.

An information bureau on the industrial application of radioisotopes has just been created. This bureau is intended to promote the rapid development of the industrial market for radioisotopes in the Community and to inform potential users of the prospects offered by this new technology.

Isotopes are being used with increasing benefit in such varied fields as metallurgy, electronics, geophysics, medicine, agriculture and industry generally.

In the course of 1960, a series of projects in this field were initiated within the Community. The Commission has a contract with the Gesellschaft für Kernenergieverwertung in Schiffbau und Schiffahrt (GKSS Hamburg), designed to speed up research on a draft design for a tanker driven by an organic moderated and cooled reactor.

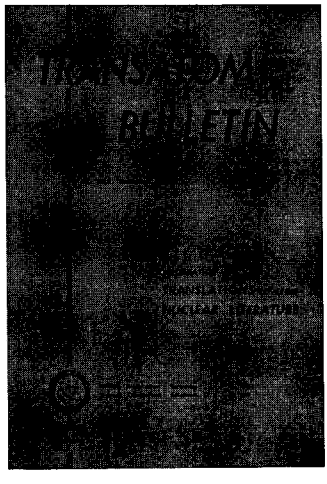
A draft contract elaborated with the French Atomic Energy Commission provides for work on a graphite-moderated, medium-temperature gas-cooled test reactor project.

Another proposal for a tanker study was submitted by the Fiat Ansaldo Company in conjunction with the Italian National Committee for Nuclear Energy.

Finally, the Reactor Centrum Nederland, acting in conjunction with a group of Dutch firms, has drawn up a draft design for a pressurized water reactor intended for use as a propulsion unit for merchant ships. The Euratom Commission has been invited to take part in the research work involved.

A committee will be set up to coordinate these various projets, alongside which the Commission is having research work of a more general nature carried out. In addition, Euratom is following up the work already carried out to coordinate laws and regulations dealing with the safety of nuclear shipping.

DOCUMENTATION - PATENTS - SUPPLY - CONTROL



I. DIFFUSION OF INFORMATION

A documentation centre has been set up and a documentation research service organized. Three documentation pools have been established jointly with Great Britain and the United States covering

— résumés on the exact sciences
— résumés on the social sciences
— the TRANSATOM BULLETIN information on texts in Slav or Oriental languages (Transatom pool).

A publications service has been set up with a library of 24,000 volumes and responsible for various publications, such as the TRANSATOM BULLETIN.

II. PATENTS

In the field of industrial property, a patents' policy has been drawn up providing a standard basis for the contracts concluded with Euratom. In conjunction with the E.E.C., Euratom is preparing the way for the unification of industrial property law in the Community countries by the creation of European patents.

III. SUPPLY

The Supply Agency started functioning on 1 June, 1960. Its field of activity includes :

— the pooling of resources
— equal access to the Community's resources
— the assurance of a common market for nuclear products.
The Agency has also undertaken a market survey (as announced in the **Journal Officiel des Communautés Européennes,** 26 July 1960), and drawn up regulations governing the Agency's right of option and conditions for ore supply contracts.

IV. SAFEGUARDS AND CONTROLS

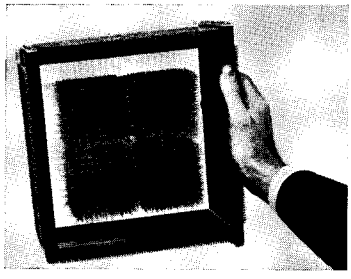
The purpose of this control is to ascertain that nuclear materials are not used for purposes other than those declared by the utilizers or stipulated by suppliers outside the Community.

— 68 projects and technical specifications have been reported concerning installations in the Community,
— 35 mines and 49 firms have reported stock movements,
— teams of inspectors have been set up.

The Commission is working to ensure that the Treaty's control arrangements are being applied.

V. COMPUTER AND SCIENTIFIC INFORMATION PROCESSING CENTRE (CETIS)

A Scientific Information Processing Centre has been set up to develop methods for recording the most complex calculations, the most diverse items of scientific information and the different scientific jargons by means of an electronic brain able to analyze, select, synthesize and retrieve the results or information requested.

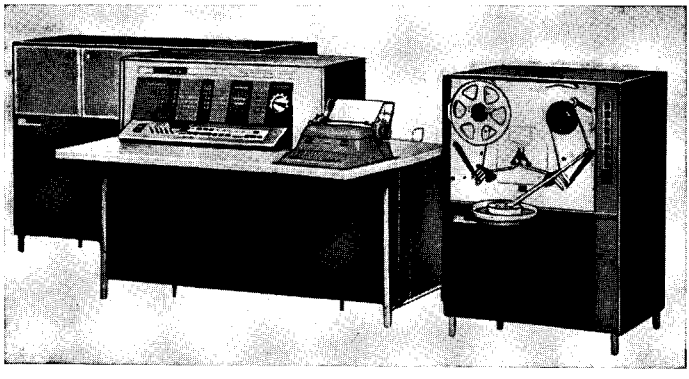


Memory component (magnetic torus matrix) of the machine.

The Centre is carrying out linguistic research aimed at the mechanical translation of the major spoken languages and is preparing an artificial language to be employed for an automatic documentation method.

A scientific computer service has been in operation since December 1960, equipped with an IBM 1620 ordinator and two E.A.I. 231-R analogue computers. It will become fully operational in July 1961, after a large-scale IBM 7090-1401 complex has been installed at Ispra. This equipment will be available for all scientific and operational calcutations of interest to utilizers in the Community.

Sixty research workers are now engaged on this project, and fourteen contracts have been placed for equipment. The Centre has established contact with other bodies, such as the European Council for Nuclear Research (C.E.R.N.), Geneva.



IBM 1620 ordinator, now part of CETIS equipment.

EURATOM AND INTERNATIONAL CO-OPERATION

A vital aspect of Euratom's work is the development of co-operation with non-Community countries and the special international organizations.

US/EURATOM Agreement for Cooperation. A supplement to the US/Euratom Agreement for Cooperation signed in 1960 provides for the supply by the USA of certain quantities of fissile materials intended for research purposes other than those originally envisaged.

UNITED KINGDOM. Contacts between the U.K.A.E.A. and Euratom, within the framework of the agreement signed in February 1959, have made possible interesting exchanges of information on fusion research and health protection. Small quantities of plutonium have been suplied to the Central Nuclear Measurements Bureau at Mol.

CANADA. The application of the Canada/Euratom Agreement is under way. It is becoming tripartite in scope, as certain points in the common research programme provided for under this Agreement now coincide with the US/Euratom joint research programme. The Agreement as a whole is based on the development of the organic liquid-cooled natural uranium heavy-water system.

With the aim of contributing to the development of relations with South American countries, Euratom and the BRAZILIAN Government have drawn up an agreement for cooperation, with the approval of the Council of Ministers. Euratom has embarked on preliminary talks with ARGENTINA. Contacts have also been made with the authorities responsible for nuclear programmes in Japan and India.

Following Canada, Denmark, Great Britain, Israel, Norway, Sweden and the United States, **AUSTRIA, CANADA** and **JAPAN** have now accredited diplomatic missions to Euratom.

The Commission is studying the ways in which relations with countries in course of development can be put onto a new basis and in which they can be helped to achieve independence. With this in view, the three Executives, on the initiative of Euratom, have proposed the establishment of an institute for research into development problems.

RELATIONS WITH INTERNATIONAL ORGANIZATIONS

Euratom was associated with the negotiations which culminated in the establishment of the Organization for Economic Cooperation and Development (OECD). Cooperation has continued with the OEEC, and in particular with its European Nuclear Energy Agency, ranging from studies on third-party liability and public health and hygiene (for instance, Euratom's Basic Health Standards), to the constructor of the DRAGON reactor (Euratom contribution : 43 %) and the operation of the HALDEN reactor (Euratom contribution : 27 %).
An agreement dealing in particular with the protection of workers and the general public against ionizing radiation was signed with the International Labour Organization on 26 January 1961.
Similar contacts have been established with the FAO and the WHO, as well as with the Inter-American Nuclear Energy Commission (IANEC).

HEALTH A

EURATOM'S AIM IS MAXIMUM SAFETY FOR EUROPE'S NUCLEAR INDUSTRY

In 1959, Euratom established regulations providing for uniform safety standards throughout the Community.

These basic health and safety standards lay down

— the maximum doses of ionizing radiation which the human body can absorb over a given period without suffering harm;
— the maximum permissible degree of exposure and contamination;
— the fundamental principles of medical surveillance.

During 1960-61 Euratom has worked to achieve legislative coordination in this field

— and to ensure the application of the basic standards in the member states.
These standards have already been partially applied in Germany whose legislation on the subject is on the point of completion. Preparations have been made to apply them in Belgium, Luxembourg and the Netherlands, and preliminary work has also been done in France and Italy.

— The Basic Standards are being revised at regular intervals.

From 5-8 September 1960, the Commission organized an international conference on the legal and administrative problems of health protection in the peaceful uses of nuclear energy.

The conference, attended by 400 delegates from the Community countries, Denmark, Norway, Austria, Israel, Sweden, Switzerland, the USA, the United Kingdom, Canada, OEEC, IAEA, WHO, FAO and representatives from trade unions organizations, dealt with the following problems :

— basis legislation on radiation protection;

— workmen's compensation for radiation injuries;

— the licensing of nuclear installations and materials;

— international control of radioactive contamination (water, air, soil).

All monitoring and control facilities throughout the Community have been listed. Many visits were made to installations in the course of 1960.

In October 1960 a report was published on the « Results of Measurements of Artificial Radioactivity in the Countries of the Community ». This is the first overall Community publication on this subject.

Work is also going ahead on the standardization and coordination of the methods of measurement employed in this field.

Among the projects for the disposal of radioactive waste which have been submitted for the opinion of the Commission has been the French plan to dump radioactive waste in the Mediterranean.

A number of contracts with specialized institutes in the Community provide for research on the permissible levels of contamination in the food cycle.

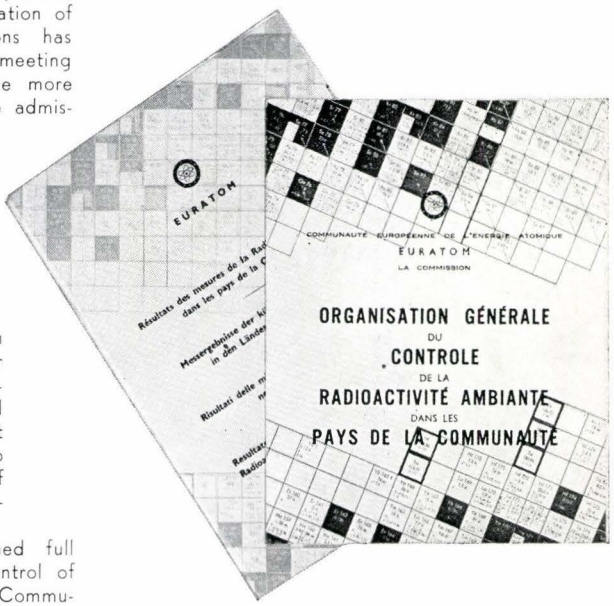
ND SAFETY

C. THE SECURITY OF INSTALLATIONS AND PROTECTION AGAINST RADIOACTIVITY

One of the Commission's tasks is to give opinions on reacter installations and their radioactive waste disposal systems. Opinions have been given on the BR 2 reactor at Mol as well as on a number of other projects.

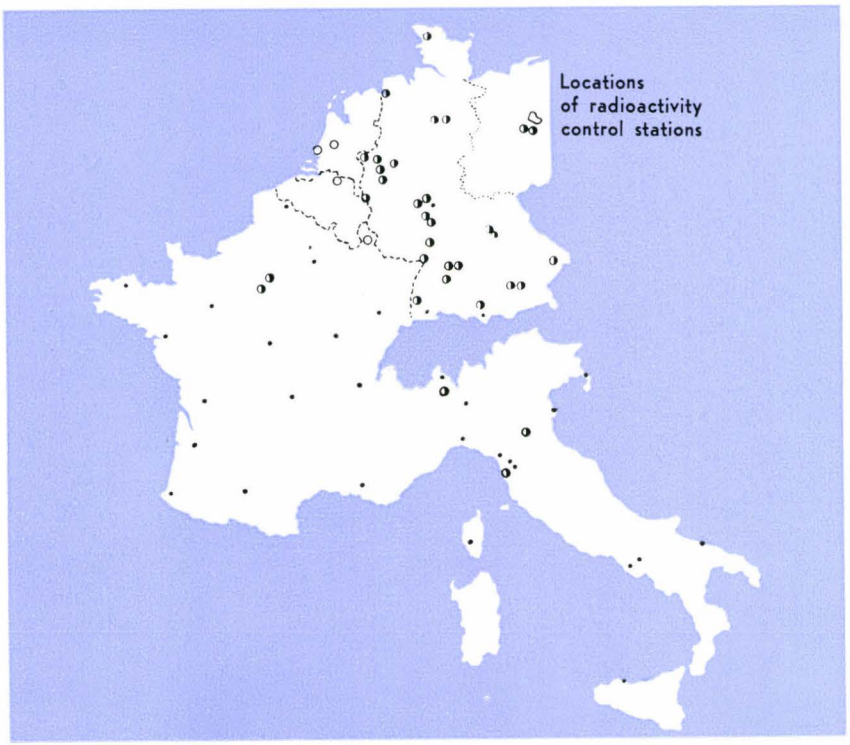
The Commission has continued to study the problems involved in the carriage of radioactive substances and in nuclear marine propulsion.

A congress on the medical observation of radioactivity in nuclear installations has taken place at Stresa/Ispra. This meeting has made it possible to determine more exactly the medical criteria for the admission and observation of workers exposed to radiation.



Finally, Euratom is participating in the social programmes of the other two Communities by making a statistical study of nuclear accidents and by drawing up a survey of relevant laws and regulations with a view to the coordination of the system of safeguards operative in accident prevention.

In 1960, the Commission published full documentation relating to the control of environmental radioactivity in the Community countries.



TRAINING AND INSTRUCTION

TRAINEE SCHEMES

To date, some 200 engineering students have been accepted, mainly at Ispra, as trainees. As part of its work of coordinating existing courses of study and training and thus facilitating the exchange of technicians amongst the member countries, Euratom is studying the possibility of granting diplomas at technical education level.

EUROPEAN UNIVERSITY

On 27 April 1960, a report on the **European University** was submitted by the Interim Committee, set up to study this project.

The University, which will be located at Florence, will be open to postgraduate students and will confer doctorates. It is also planned to grant special status to certain specialized institutes and to intensify university exchanges within the Community.

EUROPEAN SCHOOLS

In addition to the schools existing in Luxembourg and Brussels, two new European Schools have been set up, at Mol and Ispra. There are already 2,000 pupils at these four schools, which have been set up under an agreement between the six governments. The teaching is in German, French, Italian and Dutch, that is, the language of the pupils. The curricula are drawn up by a commission of teachers from the six countries. A European baccalaureat is awarded on the completion of studies. Results to date with this multi-national experiment are highly encouraging.

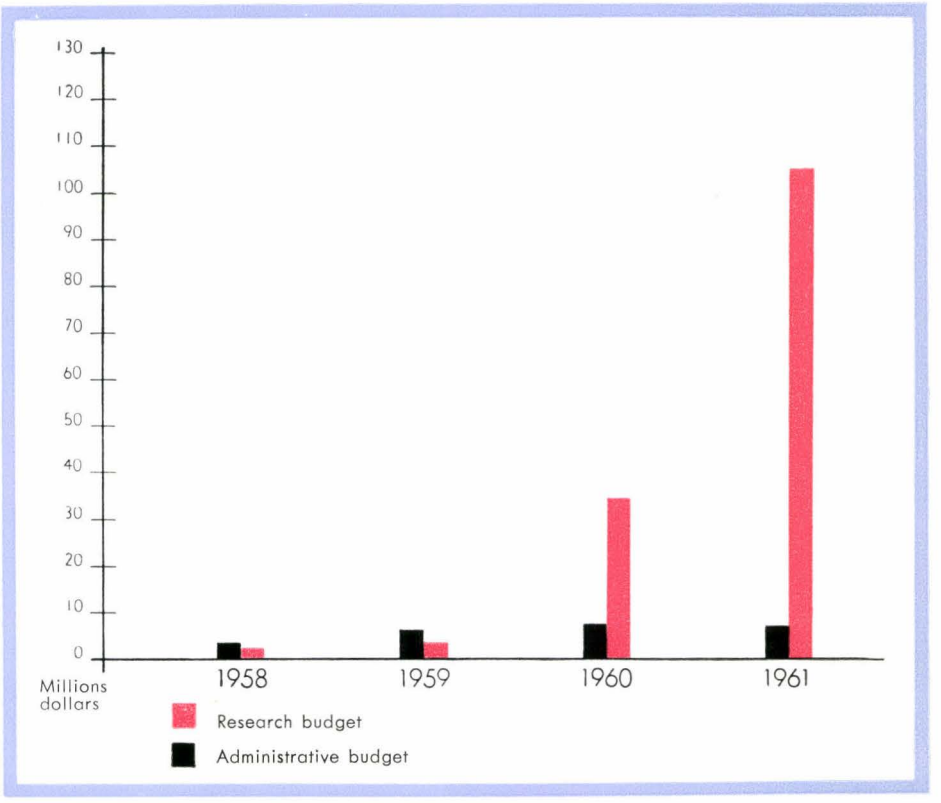
A class in the European school at Varese (near Ispra).

INTEREXECUTIVE COOPERATION

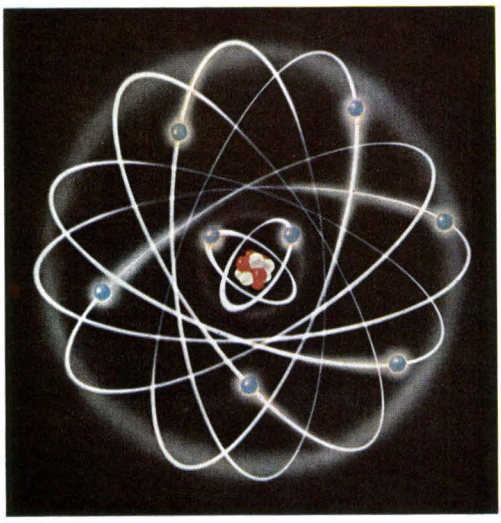
Cooperation with the European Coal and Steel Community and the European Economic Community has continued via the various interexecutive liaison bodies which exist for this purpose. Particular attention has been devoted to the study of power supply and social questions.
The joint inter-Community statistical, legal and information services have continued to operate with Euratom playing a direct or indirect part in their management. The main projects drawn up by the Commission during 1960 were submitted for discussion to the European Parliament in Strasbourg, the Council of Ministers, and, whenever necessary, the Scientific and Technical Committee.

Side by side with its fellow Community organizations, the Common Market and the Coal and Steel Community, Euratom is making an active contribution, through the exercise of its own powers, to EUROPEAN INTEGRATION

EVOLUTION OF THE COMMISSION'S BUDGET

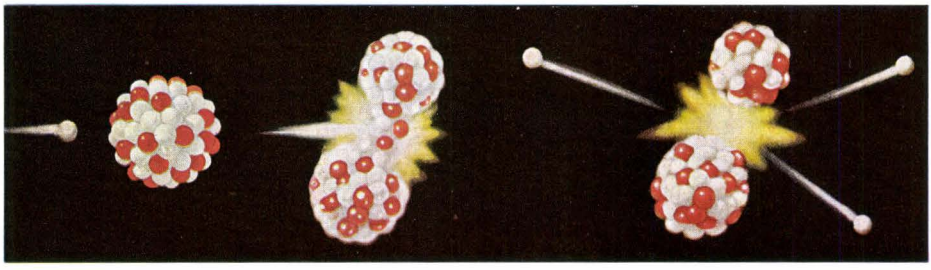


NUCLEAR



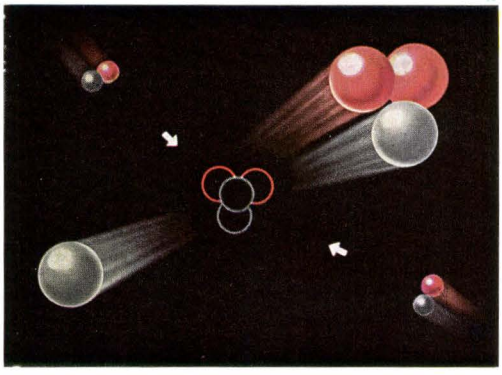
THE ATOM

The **atom** consists of a nucleus around which negatively-charged particles known as electrons move in orbit. The nucleus, made up of protons having a positive electric charge and neutrons (electrically neutral particles), is held together by a force known as binding energy. By changing the structure of the nucleus through fission or fusion this energy can be released from the atomic nucleus, thus producing « nuclear energy ».



FISSION

Fission consists in splitting a heavy nucleus into two lighter nuclei. It is generally brought about by bombarding the nucleus of a heavy element (e.g. uranium) with neutrons. The nucleus then emits one or more neutrons which in turn may collide with and break up other nuclei, thus giving rise to a chain reaction. Nuclear fission energy is the result of the loss in mass produced by such a reaction and of the collision between particles.

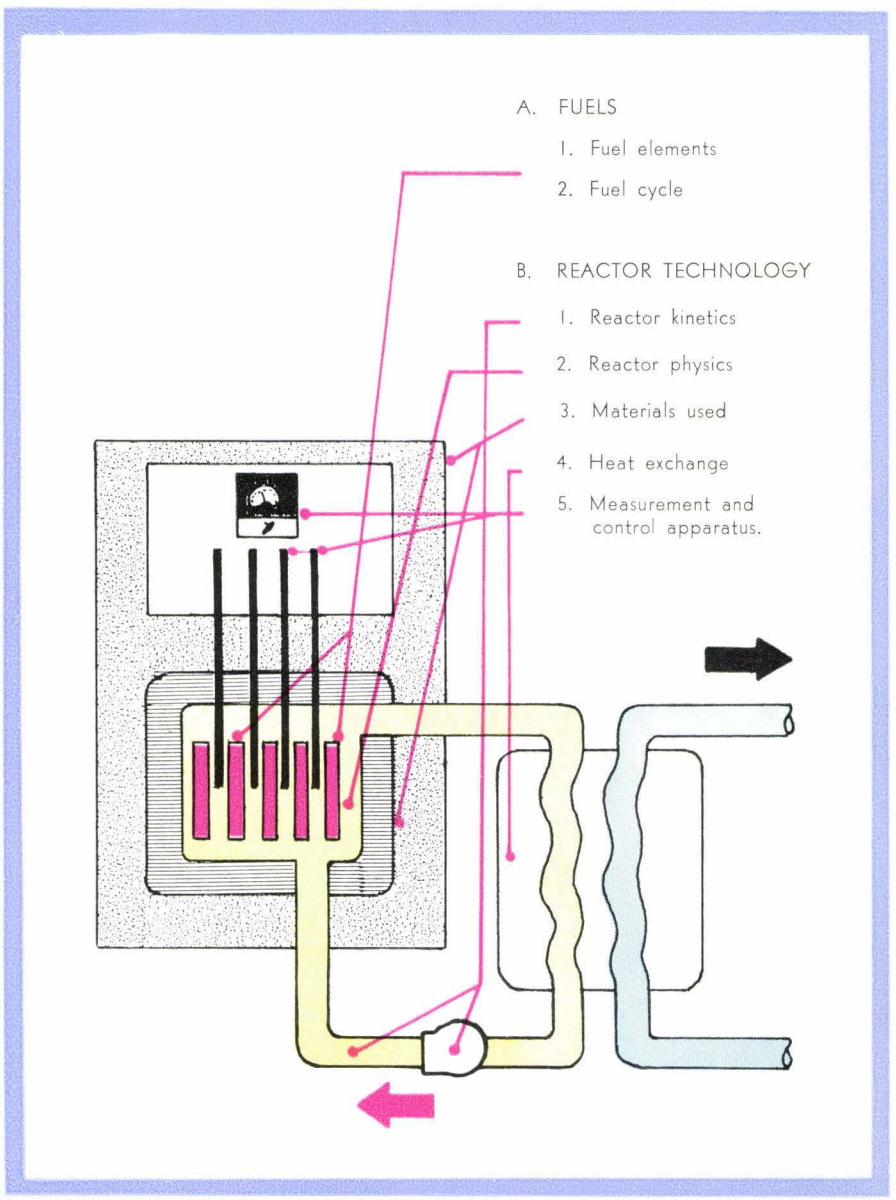


FUSION

In the **fusion** reaction, light nuclei previously stripped of their electrons come together to form heavier nuclei. As the binding energy of the new nuclei is greater than that of the constituent nuclei, energy is released. Nuclei carrying a positive electric charge partially repel each other. In order to bring them into collision so as to unite, they have to be supplied with a great deal of energy. For fusion reactions to take place, temperatures of the order of one hundred million degrees are needed.

REACTORS

The **reactor** enables **nuclear** fission energy to be harnessed. Nuclear fission is already playing a part in the production of electricity, alongside the conventional means of production. But it will not become fully effective until the power produced in this way is cheaper than conventional energy. This is why a considerable effort needs to be made to perfect not only the reactors but also each of the component elements of nuclear power production.



ABREVIATIONS USED

B.E.W.A.G.	Berliner Kraft u. Licht A.G.
C.E.N.	Centre d'étude de l'Energie Nucléaire (Belgium)
C.E.A.	Commissariat à l'Energie Atomique (France)
C.N.E.N.	Comitato Nazionale per l'Energia Nucleare (Italy)
C.E.R.N.	Centre Européen de Recherche Nucléaire
K.B.W.P.	Kernkraftwerk Baden-Württemberg Planungs G.m.b.H. (Germany)
R.C.N.	Reactor Centrum Nederland
S.E.N.N.	Società Elettronucleare Nazionale (Italy)
S.E.N.A.	Société d'Energie Nucléaire franco-belge des Ardennes
S.I.M.E.A.	Società Italiana Meridionale dell'Energia Atomica (Italy)

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