



Provision of scientific and technical services

[illegible]



**Multiannual Programme
of the Joint Research Centre
1980 - 1983**

1980 Annual Status Report

**Provision of scientific and
technical services**

Published by the
COMMISSION OF THE EUROPEAN COMMUNITIES
Directorate-General
Scientific and Technical Information
and Information Management
Bâtiment Jean Monnet
LUXEMBOURG

Reproduction in whole or in part of the
contents of this publication is free, provided
the source is acknowledged

© ECSC-EAEC, Brussels-Luxembourg, 1981
Printed in Italy

ISBN 92-825-2352-7
Catalogue number: CD-NE-81-017-EN-C

PROVISION OF SCIENTIFIC AND TECHNICAL SERVICES

1980

Research Staff: 26
Budget: 2,318,000 ECU

Projects:

- Technical Evaluations
- Technical Assistance

Programme Manager:

C. RINALDINI
Commission of the European Communities
Joint Research Centre
Ispra Establishment
I-21020 Ispra (Varese), Italy

1. INTRODUCTION

Two kinds of objectives are pursued at the JRC in direct support of the various General Directorates of the Commission: Technical Evaluations where system analysis techniques are mainly employed and Technical Assistance where laboratory measurements, technical expertises and management of projects are provided.

Technical evaluations

One of the tasks of the services of the European Communities is to study the Community's policy in various sectors, to forecast developments or to indicate targets. This is especially true for the industrial, scientific and technological policy, for the energy policy and for the policy on the resources and the environment. In these fields it is desirable to have some tools available for the analysis, to enable the Commission to get the right overview of the necessary information. System analysis is a helpful approach for the purpose, including techniques such as computer modelling and data handling, system optimization and simulation, cost benefit studies and technical assessments.

The multidisciplinary competences available and the specific competence in treating data enables the JRC to execute this kind of research in various fields.

The JRC therefore acts for the Commission as a source of technical advice, taking active part in setting up and running an information network. The work for this project is done upon specific request of the various services of the Commission. The detailed programme for each action is established yearly by an Advisory Committee of General Directorates representatives which makes a choice of the various needs and sets up priorities. Although the field of possible applications of system analysis techniques is large, three outstanding important aspects, which fit particularly well with the competences of the JRC, should be mentioned:

- Resources (e.g. model of regional development, studies on agricultural production patterns, raw material problems)
- Energy (e.g. analysis of the energy system, evaluation of technological progress, studies on energy conservation)
- Environment (e.g. collecting and updating information concerning ecological models, providing scenarios of the geographical distribution of pollutants emission).

Technical assistance

An important and expanding activity of the JRC consists in providing the Commission with technical and scientific assistance in analysing technical problems required e.g. by the implementation of new regulations, by evaluating research pro-

posals, by collaborating in the technical management of contracts, by comparing and synthesizing results etc.

These activities may involve collaboration with a number of national laboratories as well. On the other hand, the requirements of independency and secrecy which often are needed for the execution of the work, can be best satisfied in a laboratory operated by the Commission like the JRC.

The activity is splitted into two main parts: the first dealing with laboratory analyses and development of experimental techniques and the second concerning the technical assistance to project management and the provision with scientific advices.

2. RESULTS

Technical evaluations

In 1980 the activity for the project "Technical evaluations" was mainly concentrated in the energy field, covering chapters on "Energy savings", "Nuclear energy strategy studies", "Analysis of the energy system". In addition some work was also carried out on "Special transport problems", on the "Utilisation of local resources in Developing Countries", on some "Assessments on pollution problems" and on studies of the "Perception of technological risk".

Energy savings

The activity of support for energy savings in industry can be divided into two parts, respectively the Energy bus data system and the Industrial process analysis.

Energy bus data system

The Commission of the European Community has promoted an energy saving action in the field of small and medium industries.

Scope of this action is visiting, after a preliminary inquiry, a set of industries by a mobile energy unit. A team of energy saving specialists will collect data about energy use in the factory and will feed directly these data into a computer installed on the bus. Qualitative and quantitative indications of energy savings are thus quickly obtained and given to the factory managers.

Following the implementation of the "Energy bus" system in the Member States participating in the European Energy Bus Programme, a large amount of information and data will be available for analysis. An information and evaluation service is being therefore set up at the JRC to fulfill the allotted work. The main structure of a data base has been designed and implemented in order to store and evaluate data coming from different participant energy bus programmes.

The major support to any energy bus programme is a computer program system developed in Canada for Canadian Energy Bus Programme. In order to make this program suitable for use in Europe, work for the adaptation to European standards and needs have already partly been performed. These modifications regard programming language, units of physical data and electricity tariffs.

Arrangements have also been made to use the existing computer program library of the JRC, Eurocopi, for storing and distributing programs developed for the Energy bus systems.

Industrial process analysis

Given the fact that a high percentage of existing apparatuses were designed without expensive heat recuperation or other devices not justified by economic reasons in the past environment, the need now exists to reconsider the concepts of many of these designs in order to be able to reduce energy consumption in various processes.

The first process analysed was the drying process in the textile finishing industry in particular as for the mechanisms governing the drying process of textile fabrics. This process has been analysed by considering an ideal dryer without heat losses to the environment and without heat gain from electrical equipment.

In addition, for comparison of a multitude of different types of textile dryers operating in a broad spectrum of working conditions, a slightly modified standard model has been developed in analogy with the work carried out at Institut Textile de France - Nord.

The final results of the complete study are now available and are summarized in a practical chart to be used for quick evaluations of the amount of energy which may be served under different operating conditions of the textile dryers.

A start has also been made to analyse possible energy savings in the brick and tile industry. It has been estimated that 33,3% of the energy used in this branch of industry can be saved. Thorough knowledge of the most relevant working conditions of kilns and dryers and of the specification of the heat consumption over the different zones of the working cycle is however necessary to reach this goal.

Nuclear energy strategy studies

This chapter covers several studies which shall contribute to clear up some aspects of the medium and long term development of nuclear energy in Europe.

A first study concerns the transport of radioactive materials and aims to describe the management of spent nuclear fuel. A computer program called TRAM was completed and tested; it calculates the requirements in terms of transport, storage and reprocessing for a system of countries, once the capacity of power stations and reprocessing plants is known. Given all the distances among the relevant points, the program optimizes the spent fuel management.

A second study dealt with the modification of the computer program TOTEM, developed at the JRC Ispra, for satisfying the requirements of the EURATOM Supply Agency. TOTEM evaluates electrical power plant installation policies once the energy production as a function of time, the load diagram and a number of constraints are given. The modifications introduced allow to enter now as input the generating capacity of each single power plant, to perform nine successive runs (one for each country of the European Community) and provide final tables for the whole Community, to run a single nuclear plant both with Uranium or Plutonium fuel cycles and

to single out Plutonium import and export.

The new version of the computer program TOTEM is now completed and a sample case is available.

The third study was carried on in cooperation with a group of the International Union of Electric Power Producers (UNIPED) for assessing the long term prospects for the installation of Fast Breeder Reactors in Europe. Several sets of calculations, concerning nuclear power station installation policies under various assumptions and constraints, were prepared. The results of the analysis were thoroughly investigated by varying the base assumptions made:

- on the time and on the rate of development of commercial Fast Breeder Reactors
- on the nuclear electricity growth
- on the plutonium doubling time of the system

All the results are now available and they will be published in a paper which will be prepared jointly with UNIPED in 1981.

The fourth study of this chapter was only started in 1980. It tries to identify elements of judgement concerning the penetration of nuclear energy in the European energy system by analyzing the role of energy saving and of the various alternative energy sources. The energy model LABYRINTH, developed at the JRC - Ispra in the previous years, will be employed for the analysis.

Analysis of the energy system

The major effort of the all project was done under this heading and aimed to provide the Commission services with information relevant to energy policies. The study of the energy system requires, on the one side, techno-economic evaluations concerning its various sectors (household, industry, transport), and on the other side, the development of a methodology for the assessment of the relationships between the sectors and the whole economics.

The work in 1980 was centred on the first aspects of the problem, with minor contributions to the conception and implementation of the general energy model, developed in the context of the indirect activities of the Commission (EC Model).

More specifically, the studies performed covered on the one side the technical analysis of the household sector, and on the other side the contribution to the EC Model data base. It is, however, foreseen to extend this work during 1981, by preliminary considerations on the other sectors of the system and by a support for the implementation of the EC Model on the JRC main computer.

Household sector

The study of the household sector in 1980 covered a sizable effort in collecting for different European countries the required information on meteorological statistics on one side and on building characteristics and their frequency distribution on the other side.

The work was centred on the collection of data for France and Italy and the development of a suitable methodology for the

assessment of technical and economic aspects of energy saving in buildings over a large system, such as a region or a country. There are two basic aspects of this methodology: the model of the building and the description of a system of buildings.

The first part of the study was devoted to deciding about possible alternatives about the choice of the model of the building:

- dynamic or stationary model (e.g. use of the degree-days concept or of time-dependent external and internal temperatures, hence effect of heat capacities).
- uniform or different temperatures in the various parts of the building.
- average or time-dependent contributions of heat from occupancy and solar radiation.

The model BERTA (Building Energy Requirements Technical Assessment) has been written and first assessments have been carried out using a stationary description of the behaviour of a building.

For the description of a system of buildings, the subdivision has to be done of a country into climatic zones and of its building stock into categories of buildings. Here a compromise between accuracy of the theoretical model on the one side and accuracy and availability of data on the other side must be found.

The methodology for the economic assessment of the various measures (say wall insulation, double glazing etc.) are grouped according to type of house, type of measure, extent of application. All of them are ranked by the computer, according to the ratio between present worth of gains and expenditures: the computer can then choose a sequence of interventions. In this way one loses sight of the individual house and of the fact that it may be advantageous to carry out two interventions in the same house at the same time. These inaccuracies, as well as the merits of other approaches, are being evaluated at the moment. A full report about this method and a few assessment for France are being prepared.

EC model data base

The activity in this area was smaller than it was hoped. Nevertheless, progress has been made in two areas:

- development of the energy-labour methodology for the analysis of production costs.
- critical analysis of energy statistics and proposals for their improvement.

The first point is relevant for the conception of an energy model in general, since it aims at evaluating the relative merits of products or policies in terms which are independent of their cost.

The second point is particularly relevant for the EC Model data base, or any data base as a matter of fact. A draft report has been written, in which the weaknesses of present energy statistics are analysed and proposals for improvement are made.

Special transport problems

Three subjects were treated under this heading in 1980.

The first is a contribution to international cooperation in the safety of nuclear ships: participation to the final analysis of the document "Safety Recommendation on the Use of Ports by Nuclear Merchant Ships" prepared by the joint technical Committee of the Intergovernmental Maritime Consultative Organization (IMCO) and of the International Atomic Energy Agency (IAEA).

The second activity dealt with the construction of a World Shipbuilding Data Bank for the use of the Commission services. The first step consisted in the reproduction, with some changes and improvements, of the tables provided by the Lloyd's Register, London, under contract with the Commission and the subsequent elaboration of a number of new tables; it included a series of procedures to perform data validation, updating and production of the required printouts. This step has been completed and quarterly tables are now regularly supplied. The second step of the work, aiming to a feasibility study of the extension of the Data Bank by the introduction of supplementary information and modifications to obtain answers to specific problems, has been undertaken.

The third subject of this heading was the completion of the final report on a study of the prospects of combined rail-road transport which was carried out during the preceding year and which was used by the Commission services as a technical support in discussing the topic with the national experts.

Utilization of local resources in Developing Countries

In order to make more effective the support provided by the European Commission to Developing Countries, the JRC contributes with technical expertises, mainly in the energy field.

To this scope, ad hoc few weeks visits are paid to the countries where the analysis has to be performed; in collaboration with local authorities and organizations, a technical report is established in view of its use in the process of funding research and innovation projects.

Three visits were paid during the reporting period: to Ethiopia, to Zaïre and to Benin and some follow-on work was performed concerning the visits performed in the previous year to Quito (Ecuador) and to Kenya.

The visit to Ethiopia was made from 22 February to 19 March 1980, on request of the local Ministry of Mines, Energy and Water Resources for the development of alternative energies. A number of institutions have been contacted in Addis Ababa and many places have been visited outside the capital.

Following this visit, concrete proposals were made in 3 geographical areas for solar pumps, and furthermore technical considerations were made for small hydropower turbines, solar thermo panels, solar photovoltaic cells, wind-mills, biogas digesters, improved charcoal kilns, alcohol distillers, low temperature geothermic installations. Applications were considered to water pumping, micropumps, flour mills, public city traffic, high voltage line tapping, telecommunication, health posts. The problems of teaching and training,

of local machinery production and of integrated village projects were handled.

The main purposes of the visit to Zaïre were:

- Examination of the most urgent energetic needs, which could be satisfied by the use of sources of alternative energies but also by the more rational and appropriate application of classical energy
- Individuation of those requests in the energy field, which seemed superfluous or incompatible with the present state of the country
- Elaboration of proposals for the best and most economic way to put in concrete form some of the projects.

The subjects selected as the most important for a first action were the energy supply for the telecommunication system, for the river buoy system and for the radioassistance to aircraft on internal flights; few cases of energy supply in rural areas were also individuated.

Following the visit to Benin it was considered that, since Benin has a fair number of rivers and it is also a country whose agriculture is expanding, two renewable sources of energy have priority: hydroelectricity and biogas. These two sources of renewable energy should be exploited in parallel with the classical energy got from fuel, since they are season dependent.

The main project proposal for Benin concerned the set-up of an experimental station, run by the national university, where the anaerobic production of biogas should be used to:

- make electricity to be injected in the local network,
- test various types of small electricity generator units,
- demonstrate other uses, such as lighting cooking.

Besides biogas use, the station should on a smaller scale try different types of drying units for vegetables, fodder and fish.

Assessment on pollution problems

Aircraft noise nuisance

An EC aircraft noise nuisance computer program is under development to study actual noise contours at and around airports in the EC as well as to investigate the impact of possible noise reduction measures.

A demonstration of its use has been given for a number of international aircraft noise experts at the end of April 1980. Interest has been demonstrated by the experts for the use of the program especially if available on the EURONET network. In collaboration with the Institute of Sound and Vibration Research of the Southampton University, new routines are in the last phase of implementation and regard among others: computing lateral dispersion of flight tracks and easier use of multiple airports in input data.

Fertilizers

An outline of the critical path analysis applied to the study of the potential impact of heavy metals present in phosphate fertilizers on ground water quality has been set up.

Starting from the knowledge of the amounts of heavy metals mobilized in agricultural top soil, the long term effect of the heavy metal input on soil and ground water can be calculated. In the used soil-ground water migration model, which has been set up for this purpose, particular attention was given to the following factors which influence the heavy metal transport from top soil to ground water:

- the capillary measurement of heavy metals containing water in the ground water compartment
- the ability of heavy metals to be renewed by rain fall runoff to open water courses
- the transport of heavy metals to open water courses with eroded soils.

The results obtained so far indicate that for Cadmium the migration time to reach ground water is about 36 years.

The pathway of cadmium

In connection to the participation in the meetings of the working group ecotoxicology of the Commission's Services and of the Ecotoxicology Section of the Scientific Advisory Committee, a number of contributions have been given in the analysis of the Cadmium pollution in the EC.

Occupational health and safety

Technical support is given to the competent Commission's Service on the monitoring procedures and exposure limits to asbestos fibres and on the identification of the hazards due to occupational exposure to noxious chemicals in the automobile industry.

Perception of technological risk

The aim of this activity is to provide assistance to the special unit of the Commission services in charge to pursue Forecasting and Assessment of Science and Technology (FAST project).

The support is given both by assisting in the evaluation of work performed under indirect action and also by undertaking own studies in certain key areas as the risk assessment, the mapping of technical, social, economical and psychological boundaries to the acceptance of new technologies, and the identification of subjectivities in technical and economic analyses.

Work in this area has been principally concerned with evaluating research proposals, submitted by outside agencies, relating to the programme of indirect research foreseen within the FAST activities. An analysis, evaluation, ranking and set of recommendations has been completed for all contract proposals in three areas:

- representation and sharing of power in an information society
- distribution of risks and benefits associated with microelectronic applications
- social acceptability of bio-technology based activities.

Several research papers have been prepared.

Technical assistance

Laboratory analyses

The main activities developed in 1980 concerned the studies on the fertilizers, on the dairy products and on the radioprotection of the marine ecosystem.

The studies on the fertilizers implied the participation to the specialized International Standards Organization (ISO) working group in order to study the European Community fertilizers control procedures and transform them into international ISO standard forms. In particular the JRC participated to three interlaboratory campaigns, on total nitrogen determinations, on phosphate extractions and on oil retention in ammonium nitrate fertilizers.

The study on dairy products involved the evaluation of the precision and accuracy of the proposed method for the control of skimmed milk powder present in animal feeding stuffs and the study of the various interferences or adulterations.

An experimental work was undertaken aiming at the application of the proposed method to samples of skimmed milk powder and buttermilk of known composition, at the test of the method in presence of some substitute products likely to be added to feeding stuffs and also on compound feeding stuffs. The accuracy and repeatability of the method were studied.

The results of the work, now completed, proved to be quite useful.

The activity on radioprotection includes the spectrochemical method development and analyses of water and other components of the marine ecosystems.

Several sediments were collected from the gulf of la Spezia, the rivers Magra and Vara, and from the Massaciuccoli Lake, forming a well defined area. River and lake sediments were analysed for total trace element concentrations, and for some of the sea sediments, the release of heavy metals has also been studied.

A number of results was already obtained, but a complete detailed quantitative discussion of the trace element data will be given when other sediments from different zones of the Italian coasts are collected and analysed.

Scientific/technical advices

The major part of the activity consisting in providing scientific/technical advices to the Commission services dealt, during the reporting period, with the formulation of technical-scientific opinions for the Committee of Exemption of Customs Duties (UNESCO) on the qualification of instruments produced outside the Community for a duty free import.

The results of the work were: the preparation of technical documents which formulate technical judgements on the qualification of about hundred instruments and the suggestion of standards for a large family of scientific instruments for their qualification to duty free import. A computer program for the set up of a catalogue of the decision of the Committee of Exemption of Customs Duties was also elaborated.

In addition to the above activity, the JRC provided also a support to the indirect research action by providing the project leader of the project EURELIOS, the 1 MW helioelectric power plant financed to 50% by the European Commission, and by assuming the technical representation of the Commission towards the various activities of the "Solar heating and cooling programme" of the International Energy Agency (IEA).

3. CONCLUSIONS

Explicit motivation for this programme is providing support to the Commission services in various fields where the JRC has competence. By doing this, the JRC contributes with its technical and scientific work to a better accomplishment of the tasks of the Commission services in a number of sectoral policies.

The two projects included in the programme, Technical Evaluations and Technical Assistance, corresponds to two types of work: general system studies, computer modelling and technical assessments for the first project and specific experimental work or technical consultations for the second.

The Technical Evaluations project was concentrated mainly on problems concerning the energy sector, which is of high importance today and requires thorough analysis in preparation of any decision making. The JRC has a long standing competence in this field, in particular concerning nuclear energy and the modelling of the energy system; recently, the energy saving problems are also considered in deep. The work is closely connected with the Commission indirect research ac-

tion and with the Commission services responsible for energy and for industry. Collaboration with a number of national Institutes in the Member Countries is also currently achieved. Another activity concerns the study of the utilization of local resources in developing countries which is performed under request of and in tight connection with the competent General Directorate of the Commission and the local authorities of the interested countries. This activity, currently expanding, allows a direct contact between the technico-scientific research work of the JRC and the real needs of developing countries.

Finally, the studies on the protection of the environment, complementing the specific research programme existing at the JRC, provide a direct technical support for the preparation of some recommendations and directives produced by the competent Commission service; in addition, a scientific contribution was given to the FAST project which aims to exploring the long term future of the scientific and technical evolution of our society.

The Technical Assistance project allowed to back up with laboratory analyses the work of the Commission services aimed to transform the European analytical methods on fertilizers into international standard forms, to experimentally evaluate the accuracy of the proposed method for the control of adulterations in the field of dairy products, to develop spectrochemical methods for the analysis of water. In addition, technical competences were made available in various fields, in particular to help the Commission services to qualify scientific instruments produced outside the Community for a duty free import.

**Salgs- og abonnementskontorer · Vertriebsbüros · Sales Offices
Bureaux de vente · Uffici di vendita · Verkoopkantoren**

Belgique - België

Moniteur belge — Belgisch Staatsblad
Rue de Louvain 40-42 —
Leuvensestraat 40-42
1000 Bruxelles — 1000 Brussel
Tél. 512 00 26
CCP 000-2005502-27
Postrekening 000-2005502-27

Sous-dépôts — Agentschappen:

Librairie européenne — Europese
Boekhandel
Rue de la Loi 244 — Wetstraat 244
1040 Bruxelles — 1040 Brussel

CREDOC

Rue de la Montagne 34 - Bte 11 —
Bergstraat 34 - Bus 11
1000 Bruxelles — 1000 Brussel

Danmark

J.H. Schultz — Boghandel

Møntergade 19
1116 København K
Tlf. (01) 14 11 95
Girokonto 200 1195

Underagentur:

Europa Bøger
Gammel Torv 6
Postbox 137
1004 København K
Tlf. (01) 14 54 32

BR Deutschland

Verlag Bundesanzeiger

Breite Straße — Postfach 10 80 06
5000 Köln 1
Tel. (0221) 21 03 48
(Fernscreiber: Anzeiger Bonn
8 882 595)
Postscheckkonto 834 00 Köln

France

*Service de vente en France des publica-
tions des Communautés européennes
Journal officiel*

26, rue Desaix
75732 Paris Cedex 15
Tél. (1) 578 61 39 -- CCP Paris 23-96

Sous-dépôt

D.E.P.P.
Maison de l'Europe
37, rue des Francs-Bourgeois
75004 Paris
Tél. 887 96 50

Ireland

Government Publications

Sales Office
G.P.O. Arcade
Dublin 1

or by post from

Stationery Office

Dublin 4
Tel. 78 96 44

Italia

Libreria dello Stato

Piazza G. Verdi 10
00198 Roma — Tel. (6) 8508
Telex 62008
CCP 387001

Agenzia

Via XX Settembre
(Palazzo Ministero del tesoro)
00187 Roma

**Grand-Duché
de Luxembourg**

*Office des publications officielles
des Communautés européennes*

5, rue du Commerce
Boîte postale 1003 — Luxembourg
Tél. 49 00 81 — CCP 19190-81
Compte courant bancaire:
BIL 8-109/6003/300

Nederland

Staatsdrukkerij- en uitgeverijbedrijf

Christoffel Plantijnstraat, 's-Gravenhage
Tel. (070) 62 45 51
Postgiro 42 53 00

United Kingdom

H.M. Stationery Office

P.O. Box 569
London SE1 9NH
Tel. (01) 928 69 77, ext. 365
National Giro Account 582-1002

United States of America

*European Community Information
Service*

2100 M. Street, N.W.
Suite 707
Washington, D.C. 20 037
Tel. (202) 862 95 00

Schweiz - Suisse - Svizzera

Librairie Payot

6, rue Grenus
1211 Genève
Tél. 31 89 50
CCP 12-236 Genève

Sverige

Librairie C.E. Fritze

2, Fredsgatan
Stockholm 16
Postgiro 193, Bankgiro 73/4015

España

Librería Mundi-Prensa

Castelló 37
Madrid 1
Tel. 275 46 55

Andre lande · Andere Länder · Other countries · Autres pays · Altri paesi · Andere landen

Kontoret for De europæiske Fællesskabers officielle Publikationer · Amt für amtliche Veröffentlichungen der Europäischen Gemeinschaften · Office for
Official Publications of the European Communities · Office des publications officielles des Communautés européennes · Ufficio delle pubblicazioni
ufficiali delle Comunità europee · Bureau voor officiële publikaties der Europese Gemeenschappen

Luxembourg 5, rue du Commerce Boîte postale 1003 Tél. 49 00 81 · CCP 19 190-81 Compte courant bancaire BIL 8-109/6003/300

NOTICE TO THE READER

All scientific and technical reports published by the Commission of the European Communities are announced in the monthly periodical '**euro-abstracts**'. For subscription (1 year : BFR 1.500) please write to the address below.

ECU	BFR.	UKL	IR	USD.
3.60	150	2	2.50	4.30



OFFICE FOR OFFICIAL PUBLICATIONS
OF THE EUROPEAN COMMUNITIES

ISBN 92-825-2352-7

Boîte postale 1003 - Luxembourg

CDNA07263ENC