COUNCIL DECISION

of 23 November 1994

adopting a specific programme for research and technological development, including demonstration, in the field of non-nuclear energy (1994 to 1998)

94/806/EC

THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 130i (4) thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas, by Decision No 1110/94/EC (4), the European Parliament and the Council adopted a fourth framework programame for Community activities in the field of research, technological development and demonstration (RTD) for the period 1994 to 1998 specifying inter alia the activities to be carried out in the field of non-nuclear energy; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 130i (3) of the Treaty stipulates that the framework programme shall be implemented through specific programmes developed within each activity under the framework programme and that each specific programme shall define the detailed rules for its implementation, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 967 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority, subject to the availability of resources within the financial perspectives and the conditions set out in Article 1 (3) of Decision No 1110/94/EC;

Whereas the promotion of engery technologies, including the demonstration of those technologies and pursued by the Commission under Council Regulation (EEC) No 2008/90 of 29 June 1990 concerning the promotion of energy technology in Europe (Thermie Programme) (5) ends on 31 December 1994, and it is desirable to ensure that the demonstration and dissemination activities continue after this date;

Whereas the objective of the Community's activites in the field of non-nuclear energy must be to design and demonstrate efficient, cleaner and safer technologies to make energy production and use compatible with the balance of nature and with the various aspects of economic development;

Whereas, despite the current energy situation, the efforts to diversify the Community's sources of supply and to improve energy efficiency must not be relaxed; whereas RTD helps to achieve these objectives and to provide greater protection for the environment against the impact of energy technologies;

Whereas it is necessary, as the fourth framework programme indicates, to ensure complementarity between research and development and the demonstration and that the two phases of the RTD are integrated into the same energy RTD strategy in the Community;

Whereas the programme for non-nuclear energies calls for a coherent strategy covering the whole process of innovation, from scientific breakthrough all the way to dissemination;

Whereas this programme may make a significant contribution to the stimulation of growth, to the strengthening of competitiveness and to the development of employment in the Community, as indicated in the White Paper on 'Growth, competitiveness and employment', in particular by the development and by a wider utilization of efficient energy technologies;

Whereas the content of the fourth framework programme for Community RTD activities was established in accordance with the subsidiarity principle; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of non-nuclear energy;

(1) OJ No C 262, 20. 9. 1994, p. 20.
(2) OJ No C 205, 25. 7. 1994.
(3) OJ No C 295, 22.10. 1994. p. 74.
(4) OJ No L 126, 18. 5. 1994, p. 1.
(5) OJ No L 185, 17. 7. 1990. p. 1.

Whereas Decision No 1110/94/EC lays down that a Community action is justified if, *inter alia*, research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives through RTD projects to harness the potential indigenous energy resources of individual regions, taking account of the needs of less advanced regions;

Whereas the Community should only support RTD activities of high quality;

Whereas the rules for the participation of undertakings, research centres (including the Joint Research Centre (JRC)) and universities, and the rules governing the dissemination of research results specified in the measures provided for in Article 130j of the Treaty apply to this specific programme;

Whereas provision should be made for measures to encourage the involvement of small and medium-sized enterprises (SMEs) in this programme, in particular through technology stimulation measures;

Whereas the Commission's efforts to simplify and accelerate the application and selection procedures and make them more transparent must be continued in order to promote the implementation of the programme and to facilitate the action which firms, and particularly SMEs, research centres and universities have to undertake in order to participate in a Community RTD activity;

Whereas this programme will help to strengthen synergy between the RTD activities carried out in the field of non-nuclear energy by research centres, universities and enterprises, in particular SMEs, in the Member States and between these and the corresponding Community RTD activities;

Whereas the nature of the activities to be undertaken in this programme requires close coordination with activities undertaken under other specific programmes in particular those concerning industrial and materials technologies and also enivronment and climate;

Whereas basic research in the field of on-nuclear energy must be encouraged;

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should also comprise activities for the dissemination and exploitation of RTD results, in particular towards SMEs, notably those in the Member States and regions which participate least in the programme, and activities to stimulate the mobility and training of researchers within this programme to the extent necessary for proper implementation thereof;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of the progres with the said programme so as to provide all the background information needed in order to determine the objectives of the fifth RTD framework programme: whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision;

Whereas the JRC may participate in indirect actions covered by the present programme;

Whereas the JRC may contribute, through its own programme, to the attainment of the Community RTD objectives in the areas covered by this programme;

Whereas the Scientific and Technical Research Committee (CREST) has been consulted,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme, covering both the research and technological development phase and the demonstration phase in the field of non-nuclear enery, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 967 million, including a maximum of 5,0 % for the Commission's staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision No 1110/94/EC, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision No 1110/94/EC.

2. The rules for the participation of undertakaings, research centres and universities, and for the dissemination of results are specified in the measures envisaged in Article 130j of the Treaty.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, the progress within the programme in relation to the objectives set out in Annex I, as amplified in the work programme. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision No 1110/94/EC and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent qualified experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to Decision No 1110/94/EC and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. A work programme, covering both the research and development phase and the demonstration phase, shall be drawn up by the Commission in accordance with the objectives set out in Annex I and the indicative financial breakdown set out in Annex II, and shall be updated where appropriate. It shall set out in detail:

— the scientific and technological objectives and research tasks,

— the implementation schedule, including dates for calls for proposals,

— the proposed financial and managerial arrangements, including specific modalities for implementing technology stimulation measures for SMEs and the general lines of other measures, including preparatory, accompanying and support measures,

— arrangements for coordination with other RTD activities carried out in this area, in particular under the JRC programme and other specific programmes, and, where appropriate, for ensuring improved interaction with activities carried out in other frameworks, such as Eureka and COST,

— arrangements for the dissemination, protection and exploitation of the results of RTD activities carried out under the programme.

2. The Commission shall issue calls for proposals for projects on the basis of the work programme. These calls shall, whenever possible, cover both phases of the programme.

Article 6

1. The Commission shall be responsible for the implementation of the programme.

2. In the cases provided for in Article 7 (1), the Commission shall be assisted by two committees, one for the R&D and one for the Demonstration part of the programme, composed of representatives of the Member States and chaired by the representative of the Commission. The procedure described in pharagraphs (3) to (6) shall apply to each committee.

3. The representative of the Commission shall submit to the Committee a draft of the measures to be taken. The Committee shall deliver its opinion within a time limit which the Chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the Committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

4. The Commission shall adopt the measures envisaged when they are in accordance with the opinion of the Committee.

5. If the measures envisaged are not in accordance with the opinion of the Committee or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

6. If, on the expiry of a period of three months from referral of the matter to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission.

Article 7

1. The procedure laid down in Article 6 (2) to 6 (6) shall apply to:

— the preparation and updating of the work programme referred to in Article 5 (1),

— the content of the calls for proposals,

— the assessment of the RTD activities proposed for Community funding and the estimated amount of the Community contribution for each activity where this is equal to or more than ECU 0,2 million and in the case of dissemination activities equal or more than ECU 0,1 million,

— any adjustment to the indicative breakdown of the amount as set out in Annex II,

— specific modalities for the financial participation of the Community in the different activities envisaged,

— the measures and terms of reference for programme evaluation,

— any departure from the rules set out in Annex III,

— participation in any project by legal entities from third countries and international organizations.

2. Where, pursuant to the third indent of paragraph 1, the amount of the Community contribution is less than ECU 0,2 million and in the case of dissemination activities less than ECU 0,1 million, the Commission shall inform the committees of the projects and of the outcome of their assessment.

3. The Commission shall coordinate the work of the Committees and shall regularly inform them of progress with the implementation of the programme as a whole.

Article 8

Participation in the R & D part of programme only may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme and taking into account the principle of mutual benefit.

Article 9

This Decision is addressed to the Member States.

Done at Brussels, 23 November 1994.

For the Council

The President

J. BORCHERT

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

This specific programme fully reflects the orientations of the fourth framework programme, in applying the selection criteria and in specifying its scientific and technological objectives.

Section 5 of Annex III, on the first action of this framework programme, forms an integral part of this programme.

Background

The proposed agenda for energy RTD (*) is based on the following main considerations:

— The use of energy, its supply, its trade and technologies relevant to all these aspects interact in a unique and complex manner and are a determinant factor for economic growth, quality of life and the environment in a modern economy. Energy security in the broadest sense, i. e. assuring reliable energy services at affordable cost and conditions, constitutes a main reason for concern and must provide the principal motivation for supporting RTD at an European level.

— The growing concern regarding the environment in relation to the production and use of energy (contribution to greenhouse effect, emissions of polluting gas and other harmful emissions, safety, noise) and the public acceptance are today main driving forces for change.

— Finally, technology — although vital — is not in itself enough. Therefore, an effective RTD policy must consider the complete cycle embracing research, development, demonstration and diffusion of knowledge, the introduction of technologies into the market and the behaviour of the economic operators. It must integrate the different regional dimensions (local emissions, trans-frontier pollution and global pollution) and must build on concertation with other Community instruments and policies likely to affect the energy scene, such as energy policy, transportation policy, agricultural policy, structural funds, international collaboration (including Eureka) and fiscal measures.

As stressed in the White Paper 'Growth, Competitiveness, Employment', RTD should also favour the actions leading to the creation of jobs, which would be guaranteed, particularly by the strengthening of the competitiveness of the European industry.

In this sense, Community action of energy RTD could become an important driving force for economic development in general.

Indeed, there is an increasing awareness that economic development is no longer a matter of only single enterprises or sectors, but rather a set of global projects for society as a whole. One of those is to ensure sustainable energy supply for all, compatible with the maintenance of the environment and with the operation of society. This is a global challenge that must be met if conflict is to be avoided.

The Community RTD action addresses the following distinct areas:

— rational use of energy,

— introduction of renewable energies into Europe's energy systems,

— improved production and conversion and cleaner utilization of fossil fuels,

— safety of nuclear energy,

— pursuit of thermonuclear fusion as a long term option.

(*) Throughout this text, RTD covers research, technological development and demonstration.

This programme addresses the first three areas, together with a specific research activity which supports Community action in the interdisciplinary areas of energy-environment-economy. Strategic analyses will tackle medium-and-long-term issues from the technological and socio-economic viewpoint; they will consider energy and environmental specificities of Member States and regions, but also of other regions of the world (developing countries and, in particular, central European countries).

The other two lines of action on nuclear fission safety and on nuclear fusion are covered by separate specific programmes.

The proposed RTD activities

A Community RTD strategy will be set up in order to ensure the integration and coherence of all activities within the energy RTD programme. The proposed RTD activities will be deployed along two distinct phases, the R & D phase and that of demonstration but, as presented below, they will be implemented in close cooperation with one another. An activity to support the strategy effort will complete the two phases.

In order to support the technological action, specific activities for the definition and implementation of a global strategy for Energy RTD will be developed within the frame of the programme. This requires the introduction of socio-economic research, connected with the utiilization of energy as well as the development and application of new models for the analysis of scenarios consistent with the evolution of the energy scene in the medium to long term; such initiatives will allow the improvement of our knowledge on the interactions between energy, environment and economical growth and the analysis of the impacts of the Energy RTD strategy.

Furthermore, RTD efforts would include additional support and accompanying measures, among others:

— studies concerning the behaviour of economic agents in order to achieve a better understanding of the reasons which favour or hinder market penetration of a large number of cost-effective energy technologies; these studies will be complemented by market analyses and technological studies in order to facilitate the penetration of new energy technologies into the market,

— evaluation of technologies, in the more general context of political and economic instruments, accelerating their dissemination onto the market; in this connection, 'social' cost-benefit analysis, associated with the development of various forms of energy, (possibly forming a part of a European 'green accounting' framework) would help to improve the definition of such instruments; the development of RTD&D policy instruments capable of influencing the evolution of the use and supply of energy, including the public acceptance for innovative technologies, would originate from such an action.

In order to assure consistency and favour the synergies between RTD and its exploitation, a special action of dissemination and optimization of results will be followed. Use of the OPET network (offices for the promotion of energy technologies) established not only in the Community, but also in central and eastern Europe, the Commonwealth of Independent States (CIS) and the developing countries will be given priority by this action. Other instruments may be tested and deployed depending on their efficiency.

In addition, in its areas of competence complementary actions will be carried out by the JRC, especially in Section 1.1: Energy efficiency in buildings, Section 2.2: Solar photovoltaic electricity and Section 2.3: Renewable energies in buildings and industry (1).

RTD activities will include both research and development, demonstration and dissemination actions. The work planned in the various categories will of course depend on several criteria, which will be weighted differently depending on whether one adopts the R&D or the demonstration viewpoint.

Within the programme complex problems will be addressed, notably in fields such as integrated applications of renewable energies, combustion and urban transport, requiring a multi-disciplinary approach embracing the whole chain from research to demonstration with a view to market deployment. The projects within this programme may be complemented by concerted actions, restricted to those fields where a simple

(1) A description of the activities envisaged for the JRC in these areas is contained in the proposal for a decision of the Council relating to the activities of the JRC (doc. COM(94) 68 final, 30 March 1994/0095 (CNS)). An extract from this proposal is attached to this Decision.

coordination of the activities of Member States and of relevant industries would be appropriate, so as to render the programme more effective a Community level.

In this sense, research and development actions will be highly selective. Therefore, projects with a high potential for playing a true catalytic role at a European level in the fields considered as strategic for energy security, with environment as a main driving force, will be favoured.

The projects adopted along these research lines will be designed in such a manner as to harmonize results across the Community and to enable international comparisions. Furthermore, care will be taken to ensure the extension of their applicability (given the appropriate adaptations) to less developed countries, eastern Europe and the CIS. Networks of experts will be maintained or established in all Community Member States and close links with international organizations and third countries will be instigated in order to ensure the coherence of methods and approaches.

Demonstration actions are closer to the market and so they will be more diversified: they are the extension of the RTD efforts carried out by the private sector or the public sector at the Community level in the Member States. They aim at supporting more directly the different aspects of the energy policy (particularly those of the security of supply). They will be formulated such that the whole RTD effort contributes substantially to the reinforcement of the competitiveness of Euroean industry (especially SMEs) and to economic and social cohesion. This will be achieved through the development of regional and local resources. Their contribution to reducing and preventing air pollution, stimulating growth, strengthening competitiveness, increasing employment and to economic and social cohesion will depend crucially on account being taken of the possibilities for subsequent market take-up of the technologies concerned.

Different technologies (particularly combustion, gasification and storage) have a generic character useful for both fossil fuel and renewable energies. So, it is crucial to ensure the joint development of these technologies to be used for all the energetic sources and sectors.

This will enable the establishment of pilot or demonstration plants of common interest (e. g. advanced integrated gasification processes, which are usable for the combustion of either solid fossil fuel or biomass) and will help the introduction of renewable energies into the energy system.

1. RATIONAL USE OF ENERGY

Rational use of energy covers actions on energy efficiency on the demand side of the energy sector. Reducing energy consumption and stimulating market penetration of innovative efficient and clean technologies is vital in reducing dependency on external supply of energy products, and improving the impact of the use of energy in the environment.

As well as specific demonstration activities, an integrated approach will be followed for the application of clean and efficient technologies in such sectors as buildings, industry and transport. Transport is the sector whose energy demand is growing the most, therefore the Energy-Transport system will receive particular attention.

Community activities in this area will cover the following five areas:

— energy efficiency in buildings,

— energy efficiency in industry,

— energy industry, electricity and heat and fuel cells,

— energy storage,

— transport and urban infrastructure.

1.1. Energy efficiency in buildings

The objective is to achieve a substantial reduction in both energy consumption and CO_2 and other pollutant emissions in building stocks in the residential, commercial or public sectors through technical and economic improvements and efficient management and control systems.

The mechanisms aimed at improving energy economics in the building sector are not limited to technology alone, but are also dependent on a series of obstacles and distortions of social, economic and legal character or on consumer behaviour, which should be better understood. Moreover, the technological research indicated below will be followed by socio-economic research, on the same lines as actions under the Energy RTD strategy. These actions may take the form of integrated projects in a wider sense, i. e. including the concrete experimentation of economic instruments together with the introduction of new technologies. Coordination with similar activities presently carried out under the SAVE programme will be sought.

In addition, RTD will focus on the development of integrated energy concepts for both industry, buildings and agriculture, in particular cogeneration (including small combined heat and power units of 10 kWe) and other systems (equipment systems including turbines, fuel cells, diesel engines, heat pumps, batteries, etc.). Particular attention will be paid to the more efficient end use of electricity in both buildings and industry, including better transportation, distribution and storage of energy.

Research & development

R&D will be targeted on integrated projects using advanced technologies; more conventional technologies will be taken into account in the demonstration phase. Technical and non-technical barriers for decentralized energy production will also be investigated.

Within the building sector, priority will be given to 'system' approaches and these will be carried out in close cooperation with those investigating renewable energies in buildings, indicated in Section 2.3. In terms of R&D, these approaches will aim at a rational and efficient use of fossil fuels and electricity. They will include research on the 'smart' buildings, on CFC-free heat pump systems, etc.. Pre-normative type of work will also be considered. Indoor air quality will be taken into consideration.

These actions could be adapted having in mind their application in the developing countries, central and eastern European countries and CIS. In addition, this would also include results obtained in other programmes, related to RTD.

Demonstration

Demonstration activities will include low energy design, optimized materials and components, integrated load management for heating, cooling and electric consumption and optimized electric and HVAC equipment with efficient integration of renewable energy systems where possible. The demonstration work will also cover retrofitting of large commercial or public buildings and residential building stocks. Preference will be given to standardized and modular components and special consideration will be given to architectural integration systems. Indoor air quality will be taken into consideration.

1.2. **Energy efficiency in industry**

The objective is to reduce the specific energy consumption per unit of production or to increase the productivity at equal energy comsumption in order to increase the competitiveness of European industries or lead to new products.

Research & development

R & D in industry will focus on a limited number of generic technologies that are of major importance for energy, environment and — possibly — water resources. Examples include process integration and new process routes, heat exchangers (e. g. fouling), separation processes (such as membrane extraction, crystallization and absorption), stationary combustion equipment (as in Section 3.2) and the integration of solar energy. Projects on more efficient use of electricity would also be considered. The participation of industry will be strongly encouraged. Some innovative energy-efficient processes will be explored for energy intensive sectors.

Demonstration

Demonstration actions will support innovative technologies to improve or replace manufacturing processes which can lead to a substantial reduction in the energy intensiveness or consumption of the product, to an improved exploitation of residuals or waste heat, or to restricting or preventing an increase in energy consumption as a result of the implementation of environmental protection.

1.3. **Energy industry, electricity and heat and fuel cells**

The objective is to increase the efficiency both of transformation of primary energy into heat and/or electricity and of the transport and distribution of useful energy.

Research & development

R&D in the fuel cell sector will develop a strategy in cooperation with all the parties concerned and with potential users, in order to identify optimal targets. Without pre-empting the changes that might arise from this consultation, the priorities envisaged are set out below.

R&D on fuel cells will focus on complete systems and pilot plants for different applications (electricity production, cogeneration, road traction, ships and trains) by addressing the following topics:

— stationary applications (particularly cogeneration in buildings and industry): development of systems up to 400kWe with solid oxide and molten carbonate fuel cells aiming at 55 to 60 % efficiencies, ECU 1 500/kWe long-term costs and 10 to 100 times emission reduction of NO_x compared to gas turbines and diesel engines. For cogeneration in buildings, solid polymer fuel cell systems will be developed,

— road traction (electric): development of the solid polymer fuel cell for electric vehicles. The goal is a fuel cell with an efficiency of 45 to 50 %, a cost of ECU 100 to 200/kWe in the long-term and 100 to 1 000 times less pollutant than conventional systems. This development will be closely linked to R & D on the production of fuels, such as hydrogen or methanol. Road transport and, in particular, buses (where cost-effectiveness can be shown) and cogeneration in buildings and industry, will be addressed by pilot plants, in connection with demonstration.

A support activity is also planned to develop clean and efficient fuel processors (to transform natural gas, methanol and heavy oils (reformers) or coal (coal gasifiers) into hydrogen). The key issues will be their integration with the fuel cell, optimization of energy efficiency and pollutant emission for the whole system and extraction of remaining pollutants with different separation methods. Possible spin-offs from this work could be the development of new electrolysers with high efficiency (including the possible applications to renewable energy storage).

Demonstration

The objective of demonstration projects in the fuel cells sector will be the creation of the necessary conditions that will enable the users to develop the necessary confidence for the market introduction of fuel cells for electricity and heat production, as well as for the transport sector. Actions will concentrate on the demonstration of phosphoric acid, solid polymer and molten carbonate fuel cells. Progress in the 'Balance of the Plant' and technology transfer will get special attention.

General demonstration activities will cover new production cycles, combined production of heat and power, more energy-efficient methods of managing the networks for the transport, distribution and storage of energy and improvement of condensation systems.

1.4. **Energy storage**

Energy storage is a common requisite to many fields including transport, load levelling, renewable energy, electronic equipment, etc.. The present programme will focus on electricity storage by giving priority to transport (also in support of the activities foreseen by Section 1.5).

Research & development

Research on batteries will parallel that concerning fuel cells for vehicles, as in Section 1.3. It will include the development of batteries and super-capacitors for 'peaking' power in hybrid configurations with fuel cells.

Emphasis will be put on the more promising batteries such as those based on lithium polymer or those based on nickel metal hydrides in order to substitute NiCd batteries which contain toxic substances. Prenormative research on battery test procedures will be carried out within a network of battery and car manufacturers.

Other forms of energy storage will also be explored.

1.5. **Transport and urban infrastructure**

The objective is a substantial improvement in the overall energy efficiency of public transport systems, a more coherent tranport management and an increased awareness of public transport. Research on sustainable advanced road transportation systems should receive priority. This work aims to develop transport services that are attractive to the consumer, economically competitive, result in very low local pollutant emission, lead to dramatic reductions in greenhouse gas emissions and enhance energy security.

Several sections of this non-nuclear energy programme address a range of themes related to transport. These activities will be integrated into a coherent urban transport action in close collaboration with the activities of integration developed within the specific programme 'Research for a European transport policy'.

In the context of sustainable mobility under the best environmental, energy efficient and social conditions, this will help provide planning models to reduce the need for transportation and technical solutions to specific transport problems and support the rationale on which to base urban transport policy decisions.

The activities carried out in this section will be strictly coordinated with those in the transport, telematics and industrial technology programmes. The diffusion of the technologies tested in selected locations in the Community should also be extended to cover the entire European market.

Research & development

Research and development will address the integration of systems for energy storage, conversion, transmission, and management for guided and unguided vehicles. This will include consideration of chemical, kinetic and electrical energy storage systems; energy converters such as multi-fuel internal combustion engines, fuel cells and hybrid energy converter concepts.

From an energy viewpoint, the investigation of a broad range of generic technologies such as combustion modelling and simulation, computer controlled energy management systems, development of alternative battery technologies, improved transmission and regenerative braking systems and energy consumption and local consumption atmospheric pollution models will be crucial to enable progress in many of these research areas.

Optimizing available capacities will also require the application of state-of-the-art telematics to traffic management and control, and transport information systems. The results of the feasibility

studies will enable the application areas to be identified for which the different propulsion systems are best adapted, and to define the strategy to pursue the research, either to demonstrate proof of concept, or in the case of more mature technologies, the definition of full-scale demonstration projects in connection with the demonstration activity.

Demonstration

Demonstration actions will include traffic management and control techniques, including advanced information systems for users, improved modal interchange infrastructure, efficient public transport vehicle fleets in urban areas and complementary measures to promote a shift from private to public transport. Consideration will be given to integration and modal shifts. Activities will also cover energy efficiency improvements on new types of traction systems for vehicles using alternative or conventional fuels, including electric, hybrid and fuel cell vehicles. Particular attention will be paid to electric cars, especially in the urban setting, in order to avoid the adverse effects of exhaust fumes from combustion engines on people, buildings and the cultural heritage.

2. RENEWABLE ENERGIES

Renewable energies, in their new and modern forms which go beyond the classical usages of hydraulic power and wood for heating, are far from having realized their full potential because of lack of development. Nevertheless, these clean and indigenous energy sources appear to be well adapted to combat the greenhouse effect and to contribute to long-term energy security. As sources of technological innovation, they could be instigators of new industrial activity and employment at all levels, especially in the less-favoured regions of Europe. In addition, because of their decentralized nature, they are much more accessible to the layman. In the framework of international cooperation, the renewables will also have an important role to play in ensuring that the Third World, which will become the largest energy consumer, does not also become the greatest polluter.

Considering the association between quality of life and social impact, these are important sources which will in future allow a sustainable increase in energy consumption, based on total economic growth, while respecting the environment.

This programme foresees a new dimension for the renewable energies which will permit the introduction of new sources on a significant scale into the European energy system. With this aim, an appropriate strategy will be adopted in order to concentrate the effort on ambitious but realistic objectives for the short to medium term.

Integration with the Third World and with eastern Europe will also require a specific effort to adapt the technologies, prepare their transfer and support European industry for future export markets.

For the programme as a whole, the R&D accent will be put on state-of-the-art technologies which, except in a few cases, are still far from the market. Research and development activities will be undertaken in order to achieve priority goals of a scientific, technological and industrial character. A link will be established with non-technological instruments in order to reduce legal and administrative obstacles. More emphasis will be devoted to investigation of those policy instruments which will be required for the introduction of renewable energy including socio-economic research, planning and training (in the framework of support actions to the RTD Energy Strategy).

In Demonstration, the emphasis will be on targeted demonstration ventures in order to achieve in the short-and mid-term significant energy objectives. Demonstration actions in the field of renewable energies will cover all renewable energy sources, where appropriate in association with other community actions, in order to stimulate the market and to achieve agreed energy objectives.

To this effect, the activities of this chapter will be carried out in close conjunction with those of the chapters on 'Rational use of energy' and 'Fossil Fuels' (in particular co-combustion, production of electricity and heat, storage, fuel cells, energy savings in buildings) which have a direct interest in obtaining the technical and economic objectives regarding the introduction and utilization of renewables energies.

The financial efforts, which will be concentrated as a priority in areas 2.1 to 2.5 below, will be devoted to the following themes:

2.1. **Integration of renewable energies**

Research & development

This new initiative will be aimed at easing the integration of renewable energies from the technological point of view by taking into account economic and social aspects. In many ways, the renewable energies involve activities across all sectors of society.

Multidisciplinary activities will be initiated among the professions concerned, researchers, industrial groups and future users, to ensure accelerated deployment on as large a scale as possible. Special emphasis will be put on the integration of renewable energies into future energy systems as well as into the rural setting and large-scale integrated projects such as the development of electricity production from renewable energies. The impact of renewable energies will be studied in depth, especially in the areas where they will be developed, such as regions and towns, agriculture and industry, distribution networks; the impact on society and other dimensions will also be analysed. Development agreements and specific and sectorial programme actions will be arranged by means of networks, several of which will be linked in a ' major network for the development of renewable energies'. It will include among others thematic subnetworks, major European electric utilities, leading architects and building engineers, specialized research centres, pilot towns, regions and islands. Coordination will be ensured with activities currently carried out under the Altener programme, taking account of the objective for a significantly higher renewable energy share in Europe's energy system and economy.

Integration with the Third World and with eastern Europe will require a specific effort to adapt the technologies, prepare their transfer and support European industry for future export markets.

2.2. **Solar photovoltaic electricity**

Research & development

In R & D, the accent will be put on a 'three stage' vertical approach which will consist first of the continuation of research into crystalline or thin film solar cells, drawing together industry with university and para-university research laboratories. Other efforts will be devoted to accelerated industrialization of cells and modules. This is a new Community initiative to support RTD in industry, especially SMEs, relative to the aspects of precompetitive development engineering, flexible industrial processes and very large volumes.

The aim of this work will be to define guidelines directed at a production cost level of ECU $1/W_{peak}$ for multi-MW production lines.

Finally, the development and demonstration of pilot phovoltaic systems will be accelerated, in order to reduce costs and improve performances and the reliability of equipment. The testing and calibration of the new photovoltaic modules and systems will take place at the JRC in close collaboration with national research centres, in order to enable the elaboration of European norms and specifications regarding their utilization by producers and users.

An important objective will be to bring the reliablility and lifetime of complete photovoltaic systems (excluding electrochemical batteries) up to that of photovoltaic modules (lifetime of at least 20 years).

Demonstration

Demonstration activities will cover in particular the large scale commercialization of remote stand-alone photovoltaic applications and grid connected systems, and will involve electricity utilities and other key players.

2.3. **Renewable energies in buildings and industry**

Research & development

The best approach in this sector is also vertical and will consist in pursuing the efforts on components and integration procedures for active and passive solar, natural lighting and others. The research will concentrate on buildings and will be pre-normative but oriented towards the possiblities of standardization. Indoor air quality will be taken into consideration.

At the second level, the work on development of pilot buildings will be followed up, with the essential criterion of energetic aesthetic and architectural success. A new aspect in this context will be the development of bioclimatic habitat and the energy renovation of existing buildings.

Finally, a modern urbanization scheme will be developed in harmony with the specific needs of energy, architecture and social organization with a new integration of work, life and leisure in the town. This development should promote new pilot clean urban districts with minimum emissions. This last level of activities will best be implemented as a concertation with the networks of towns, regions, experts in solar urbanization and architects.

This initiative will aim at defining planning and associated technologies for new urban concepts based on the principles of solar architecture.

These actions will take place in a complementary and coherent way to those regarding the rational use of energy in buildings as stated in Section 1.1.

Demonstration

Demonstration activities will cover thermal applications for the production of large quantities of hot water (or other fluids) for heating and/or cooling applications and the production of large quantities of hot air for ventilation or drying. High temperature solar thermal energy in combination with fossil fuel power production will also be covered.

2.4. **Wind energy**

Research & development

The R & D activities will be vertically integrated as follows: first, new materials and components will be developed, particularly blades in advanced composites. Then, after completing the development programme for the current generation of wind turbines, a programme will begin on the development of a new more powerful generation exceeding 1-2 MWe and using new ultra-light blades and other novel components. Highly innovative wind turbines of smaller sizes could also be considered. Noise reduction will be investigated.

The general goal will be to make wind energy cost-competitive with lowest conventional electricity sources (e. g.ECU 0,04/kWh) and more acceptable to the public.

Finally, the programme will aim to promote alternative installation sites, especially in complex terrains and by extending to lower average wind velocities the situations in which wind power may be competitive.

Demonstration

Demonstration will concentrate on those technologies which will improve performance, efficiency, reliability and noise reduction, and achieve cost reductions. The maximum exploitation of wind potential will be achieved by the largest application of medium-sized wind turbines and of machines designed especially for lower wind potential and for new application in individual installations or in wind farms.

2.5. **Energy from biomass and waste**

The objective will be to reduce harmful emissions and the costs of electricity generation, improve reliability, promote the broader use of known technologies, improve their application and integration, increase their competitiveness and reduce their cost.

Research & development

This sector is particularly important for R & D actions and for their links with the environment and regional and rural development. An integrated biomass-bioenergy approach is necessary to assure the coherence and the pertinence of the Community R&D activities regarding the whole bioenergy chain in its technical and non-technical dimensions. Those included are, for instance, the aspects of energy balance, the cost-efficiency factor, the impact of national policies, etc., the combined production and treatment of basic agricultural products, utilization and conversion of these materials for the production of energy. Advanced conversion processes leading to the production of hydrogen from biomass will also be studied.

This strategic action will be implemented in conjunction with the AIR programme. The agro-industrial programme will concentrate on the production of basic materials, the know-how and their treatment, while the energy programme will focus on the conversion and utilization of biomass, on the utilization of new fast growing forestry, agricultural products or waste which will provide the basis for a second activity, leading to thermal conversion to liquid, gaseous and solid fuels or directly to heat. Urban, agricultural and industrial wast and waste from woodlands will be considered in connection with activities described in Section 3.1.

The programme will aim at demonstrating the feasibility of sustainable biomass production and utilization for electricity and thermal energy, and transport fuels via thermochemical conversion routes.

Furthermore, pilot projects will be developed, notably for decentralized production of electricity using high performance generators (engines and turbines).

Demonstration

Demonstration activities will concentrate on energy production from solid biomass as a fuel, production, substitution and/or energy savings from municipal, industrial, agricultural, animal and forestry wastes, and the reduction of costs for providing the energy produced from biomass.

2.6. **Hydroelectric power**

Demonstration

This area will be supported only within the framework of demonstration projects. Activities will cover design and construction, materials or methods of operation and control of new technologies. Industrial initiatives to produce high quality, reliable and competitive standard equipment and to perfect simple, reliable and cheap techniques or technology will also be promoted, especially those adapted to the markets and needs of countries whose development is lagging behind. The rehabilitation or modernization of abandoned sites or those which are approaching the end of their lives, by the use of high performance or state-of-the-art technologies, will also be covered. Barriers to the diffusion of hydropower deriving from environmental and land management problems will be addressed.

2.7. **Geothermal energy**

Research & development

The remaining element of geothermal energy R&D which may merit continuing support on a European scale is hot dry rock. Work will be focused on the support of a single European pilot plant that could provide the basis for a demonstration prototype at a later stage. Technologies relevant to

hot dry rock may also be studied through the stimulation of low permeability zones in high enthalpy fields. The latter would contribute directly to conventional geothermal energy exploitation, which will otherwise be treated in the demonstration phase. In additon, further research in certain other aspects of conventional geothermal energy may be carried out.

Demonstration

Work here include improvement of techniques in the drilling sector, wellhead equipment, corrosion, scaling, automation and treatment systems for brines, the exploitation of geothermal fields where the resources are proven, and the development of geothermal applications in agriculture, aquaculture and district heating.

2.8. Other options

Research & development

Some limited action could be undertaken on different families of renewable energies which are at different stages of development. These could cover wave and tidal energies, micro-hydro, solar thermodynamics, clean production and use of hydrogen and others. This work will aim at developing pilot plants rates at a few MW_e. Technologies associated with renewables will also be considered, notably storage of thermal or electrical energy. The main objective will be to develop new pilot storage devices (e. g. batteries, flywheels, hydrogen).

3. FOSSIL FUELS

The world energy economy is predominantly fossil fuel based and it is likely to remain so for a long time. In the Member States, the consumption of fossil fuels such as coal, petroleum and natural gas represents, at present, 82 % of the overall energy consumption in the Community. This part will grow regularly in the coming decades, with some variations among the different sources of energy.

Natural gas, for example, will continue its penetration into the European market even though its transportation over long distances (from Africa, Siberia, North Sea), in liquid form (LNG) or as gas, has a number of technical and economic constraints. The latter is a severe handicap to its utilization. Coal, where worldwide reserves will guarantee several hundred years of supply, is a major and growing player, but cleaner methods of use are required. The petroleum share, on the other hand, will grow very slowly but constantly over the coming years. This increase will take place essentially in the transport sector.

A major problem for fossil fuel use is the emission of CO_2 and other gaseous and solid pollutants. Hence Community action should, as a priority, provide guidance and incentives to reduce pollution emission and to increase the conversion and utilization efficiencies of fossil fuels.

R&D in this section addresses the improvement of coal and hydrocarbon-based energy conversion systems, the development of new energy systems, energy savings in the demand sectors, energy storage and the more efficient exploration and production of indigenous resources of hydrocarbons.

In addition to these specific activities, an integrated approach will be sought for the application of clean and efficient energy technologies in the relevant sectors such as in building, industry and transport. Since transport is the energy sector where energy demand has shown strongest growth, the energy-transport system will receive particular attention and it is envisaged that it will include an integrated project on urban transport.

3.1. Clean technologies for solid fossil fuels

The term 'solid fuels' covers all solid fuels linked to coal, such as lignite and peat, together with orimulsion and other heavy fuels produced by the refining of petroleum. These fuels can be used

separately or mixed with urban, industrial or agricultural waste or residues, or with biomass, providing that the emissions are of the same level and that the main part of the energy is produced by the solid fuels. Furthermore, synergies between solid fuels and natural gas processes will be considered.

Demonstration actions in the field of solid fuels will be coordinated with research actions in the corresponding areas and integrated into the European network which should be established.

A wide-ranging action, taken in cooperation with the second action of the framework programme and in synergy with the R&D work, will be aimed at the developing countries and eastern Europe so that the production and use of coal in those countries should be as non-polluting as possible. Without neglecting advanced technologies, this action will take due account of conventional options in so far as they can contribute in the short term to significant reduction of pollution levels.

The objective will be the reduction of the emissions produced by the utilization of solid fuels, and in particular to make coal fired power production cleaner by reducing CO_2 and other greenhouse gas emissions and, in so doing, reducing harmful gaseous emissions into the atmosphere, rendering the solid residues more neutral and consuming less coal for the same amout of electricity through improved efficiency or partially replacing coal by 'CO_2-neutral' fuels (biomass and wastes) at acceptable costs.

Research & development

Work will be carried out on processes intended to penetrate the market in the short, medium and long term. The short-term option aims at improving substantially the efficiency of conventional steam cycle based power plants and to achieve efficiencies above 40 % with coal/biomass/waste blends.

The medium-term option aims primarily at IGCC (integrated gasification combined cycle) processes with efficiencies above 45 % and further reduction of pollutants. The long-term option aims at the development of the 'post-IGCC generation' processes (efficiency high than 50 %).

Preference will be given to medium- and long-term options. The conventional options will, however, receive appropriate support in cooperation actions with the developing countries, the countries of central and eastern Europe and the CIS in synergy with the second action of the framework programme.

The research and development projects will include:

— development of integrated gasification combined-cycles and advanced (pressurized) and atmospheric combustion processes (supercritical-steam cycles or combined-cycles) for higher efficiencies and increased abatement of pollutants (either at the source or in flue gases) including hot gas cleaning and novel processes,

— development of processes for the combined gasification (or combustion) of coal with biomass, industrial, municipal or agricultural waste, which could entail a 10 to 20 % reduction in CO_2 emissions, this action would be linked to those mentioned in Section 2.5); careful control of all emissions and residues. At most the evaluation of methods for CO_2 and disposal should be part of the programme,

— research for the integration of high temperature materials into advanced systems (rather than on the materials themselves),

— integration of fuel cells using gas from solid fuels in combined cycles (demonstration on existing fuel cells in the framework of RDT as mentioned in Secton 1.3).

R & D will be implemented through integrated or targeted projects. The main objective will be to set up a European network of excellence to ensure an efficient application and utilization of the best available coal technologies. In the course of the programme, cooperation activities will be established in particular with eastern Europe and China.

Demonstration

The priorities of the demonstration activities, dissemination and valorization will include electricity and heat production from solid fuels, valorization of by-products and production of raw materials. The synergies with natural gas will be investigated.

Electricity and heat production will include:

— circular atmospheric fluidized bed combustion,

— luidized bed combustion under pressure, stationary or circular,

— primary measures for the reduction of emissions and the treatment of the flue gases.

In this activity, integrated gasification combined cycle and topping cycle, treatment of gas at high temperature and fuel cells utilizing gases from solid fuels, will also be supported.

3.2. **Generic combustion**

Research & development

A generic research action on combustion will be introduced to bring about significant advances in energy efficiency and pollution abatement of combustion processes. The research work will address fundamental and generic research such as: basic research to identify causes of pollutant formation, modelling of combustion processes and systems, diagnostic equipment, improvement of systems, and treatment of exhaust gases, etc.

The technologies to cover, by means of a generic approach, include internal combustion engines, including the use of alternative fuels, gas turbines, combustion and gasification of coal and biomass, and combustors for stationary applications in buildings and industry.

This action will be carried out in cooperation with major European car and boiler manufacturers, oil companies, utilities and users with a view to ensure technology transfer from the research community to the users. This action will take into account the European programme on engines, fuels and emissions project launched by the Community in collaboration with European oil and car manufacturer associations.

3.3. **Hydrocarbons and new fuels in transport**

Research & development

In this area, emphasis will be on the development of clean transport fuels by improving the efficiency of fuel reformulating processes. The work will concentrate, *inter alia*, on the catalytic conversion of natural gas into liquid fuels (and fuel additives) which have a higher added value and can be more easily transported. In this context, the global socio-economic impacts and the security of supply, related to the utilization of alternative fuels such as the methane will be considered.

Given the increased need for light products and the subsequent reduction in the demand of heavy oils, R&D efforts may be pursued on the catalytic conversion of heavy oil fractions.

The utilization of alternative fuels including hydrogen and mixes will also be investigated. Work will continue on the establishment of the relationships between fuel quality, engine technology and emission of pollutants and this mainly within the framework of the European programme on engines, fuels and emissions project previously mentioned in Section 3.2. Attention will be paid to refuelling infrastructures for alternative fuels.

Demonstration activities will focus on natural gas processes, as described in Section 3.4.

3.4. Exploration and production of hydrocarbons

The objective of activities in this area will be to strengthen the industry's capability to answer the short- and long-term requirements for the availability and implementation of efficient technologies in the field of oil and natural gas. Particular attention will be paid to the eastern and central European and CIS markets.

R&D actions will address medium- to long-term issues with the aim of improving the exploitation of hydrocarbon fields and underpinning the European industrial technology base. Demonstration, dissemination and optimization activities are particularly important in this area to assist market penetration of new technologies in the industry, with important strategic implications for the European Union's economy, competitiveness and energy supply. Beneficiaries in both categories will be mainly oil and gas-related companies which are developing innnovative and effective technologies to improve the exploration, production and use of hydrocarbons, as well as supply and service industries, with emphasis on SMEs.

Research & development

R & D will focus on:

— development of efficient technologies leading to improved reservoir characterization and management and to more accurate prediction of reservoir production; work will also be undertaken on the thermodynamics and modelling of complex fluids, in support of investigations on enhanced recovery techniques, and the modelling of fluid transportation in boreholes and pipeline networks,

— sedimentary basin analysis and three-dimensional modelling to give a better description of basin formation and geo-historical evolution,

— idenfication of both smaller and more complex deep structures using advanced geophysical and geochemical exploration methods,

— development of technologies to improve drilling efficiency, performance of wells and to allow the exploitation of deep offshore, marginal and satellite fields, as well as very deep fields with high temperature and high pressure.

Furthermore, it is planned to follow concerted research action on earth science. This action will not only provide the information needed in hydrcarbon exploration but would also improve the scientific knowledge base of o the research areas.

Demonstration

Demonstration activities will cover both 'upstream' and 'downstream' sectors:

— In the upstream sector, activities will cover methods for enhancing exploration capability, new technologies for marginal field exploitation, safety and environmental protection; they will embrace both exporation and production and seek cost reduction. Special attention will be paid to the North Sea and those reserves where economic conditions are difficult.

— The transport and storage of fuels will be addressed, with particular attention to underwater gas pipelines and LNG systems.

— Downstream activities will concentrate on the uses of natural gas, for example, gas conversion and gas use in the transport sector or in the improvement of industrial processes.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

(ECU million)

Area	R & D	Demonstration	Total
1. Rational use of energy	116	145	261
2. Renewable energies	271	164	435
3. Fossil fuels	48	223	271
Total	435	532	967 (1) (2)

(1) Of which:
- a maximum of 2,85 % for staff expenditure and 2,15 % for administrative expenditure,
- up to 6 % to support the definition and implementation of activities for the RTD energy strategy (including the modelling activity and socio-economic research) and of the programme,
- ECU 24 million for the dissemination and optimization of results,
- up to 5 % for specific measures in respect of SMEs.

(2) A sum of ECU 35 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the fourth RTD framework programme for non-nuclear energy is earmarked for the specific RTD programme, to be carried out on the one hand by means of direct action (JRC), and on the other by means of activities within the framework of a competitive approach and intended for S/T support to Community policies (1995 to 1998)'.

This breakdown between different areas does not exclude the possibility that a project could relate to several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

The programme will be executed through indirect action, whereby the Community makes a financial contribution to RTD activities carried out by third parties or by JRC institutes in association with third parties:

1. Shared-cost actions of the following types:

   (a) R&D projects carried out by undertakings, research centres and universities, including, where appropriate, basic research of an industrial relevance.

   Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

   (b) Demonstration projects jointly financed with other sources in the public and/or private sector and, usually, at least one operator to guarantee continuity, may qualify for a Community contribution up to a maximum of 40 % of the eligible cost of the project, the rate descreasing for projects closer to the market.

   The objective of the demonstration projects will be to prove the technical viability of a new technology, together with, as appropriate, its possible economic advantages.

   (c) Technology stimulation to encourage and facilitate participation of SMEs in RTD activities,

   (i) by granting awards for carrying out the exploratory phase of a collaborative RTD activity, including the search for partners, during a period of up to 12 months. The award will be granted following the selection of an outline proposal to be submitted normally by at least two non-affiliated SMEs from two different Member States. The award will cover up to 75 % of the cost of the exploratory phase without exceeding ECU 45 000 or ECU 22 500 in the exceptional case of a single applicant SME; and

   (ii) by supporting cooperative RTD activities, whereby SMEs normally having similar technical problems but not having adequate own research facilities, engage other legal entities to carry out RTD on their behalf. Community funding for cooperative research projects, involving normally at least four non-affiliated SME's from at least two different Member States will normally cover 50 % of the cost of the research.

   Following an initial call, in both cases proposals may be submitted at any time during the period covered by the work programme being implemented.

   These activities will be complemented by specific preparatory, accompanying and support measures.

2. Preparatory, accompanying and support measures, such as:

   — studies in support of this programme and in preparation for future activities,

   — support for exchange of information, conferences, seminars, workshops or other scientific or technical meetings, including intersectoral or multidisciplinary coordination meetings,

   — use of external expertise, including access to scientific databases,

   — scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities carried out under the third activity; the factors liable to encourage use of results will be taken into account from the outset and throughout the duration of RTD projects, the partners in which will constitute a key network for diffusion and exploitation of results,

   — analysis of possible socio-economic consequences and technological risks associated with the programme, which will also contribute to the programme 'targeted socio-economic research',

   — training actions related to RTD covered by this programme in order to stimulate technology transfer and enhance employment skills,

— independent evaluation of the management and execution of the programme and of the implementation of the activities,

— measures in support of the operation of networks for increasing awareness and providing decentralized assistance to SMEs, in coordination with the Euromanagement auditing activity of RTD.

Community funding may cover up to 100 % of the costs of these measures.

3. Concerted actions consisting of the coordination, of RTD projects in the programme and those already financed by public authorities or private bodies. Concerted actions may also serve as the necessary coordination for the operation of common interest groups (networks of excellence) which, through shared-cost RTD projects (see 1 (a)) bring together around the same technological or industrial objective manufacturers, service providers, users, universities and research centres.

Community participation may cover 100 % of the costs of the concertation.

Description of the Joint Research Centre's (JRC) research activities corresponding to the areas covered by this specific programme and the subject of the proposal for a Council Decision for the JRC programme (COM(94) 68 FINAL — 94/0095 (CNS))

The JRC will contribute to the develoment of technologies for cleaner and more efficient use of energy through prenormative research, with the emphasis on environmental aspects, in the following sectors and in close cooperation with the corresponding shared cost action programme:

— photovoltaic energy: the activities will include component tests and studies on the design and control of large-capacity systems. The research will be based on the use of the ESTI ('European Solar Testing Installation') of the JRC and on networks with partners in the Member States. Basic scientific research into energy savings will be continued,

— materials for clean technologies: research will cover the development of materials for clean technologies such as long-lived catalyst supports for emission control, nanoporous ceramic membranes for advanced ceramic filters, ceramic alloys and composite materials for high-temperature applications (turbines and heat exchangers).