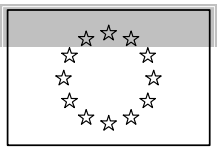
European Commission

Community Research



SP1 – Priority 6-1

6.1 Sustainable energy systems

Work Programme

Revision 2
April 2004

6.1 Sustainable Energy Systems

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6.1.1.Introduction

Europe's energy system demonstrates unsustainable patterns of development characterised by growing dependence on imported fossil fuels, rising energy demand and growing CO_2 emissions. These unsustainable patterns are exacerbated in key sectors like buildings and transport that are intimately linked with the quality of life of European citizens. The challenge is to alleviate and reverse these adverse trends to achieve a truly sustainable energy system, while preserving the equilibrium of ecosystems and encouraging economic development.

The strategic and policy objectives of this programme of research[1] into sustainable energy systems include reducing greenhouse gases and pollutant emissions (Kyoto), increasing the security of energy supplies, improving energy efficiency and increasing the use of renewable energy, as well as enhancing the competitiveness of European industry and improving quality of life both within the EU and globally (Johannesburg follow-up).

In addressing these objectives through this Work Programme, a clear differentiation is made between research activities having the potential for exploitation in the short to medium term and those which are expected to have an impact in the medium to longer term. This distinction between the short-to-medium and medium-to-long term time frames is applicable to all indirect research actions in the sustainable energy sector and it is intended that the budgetary appropriations be split equally between the two time frames.

Research activities having an impact in the short to medium term

Community research is one of the main instruments which serve to support the development and implementation of new legislative instruments and other policy measures in the field of energy and to change significantly current unsustainable patterns of development. In the short to medium term, the goal is to pave the way for the introduction of innovative and cost competitive renewable and energy efficiency technologies into the market as quickly as possible through demonstration and other research actions aiming at the market, thus supporting the future development and implementation of the EU Directives on electricity from renewable energy sources and on the energy performance of buildings, as well as the proposed Directives on cogeneration (CHP) and the establishment of regulatory and fiscal measures for the promotion of liquid biofuels.

From a programme implementation perspective the objective is to bring forward and demonstrate the next generation of cost-effective technologies at full scale. The scale of demonstration projects should allow a comprehensive life-cycle assessment under real life conditions. New integrated projects will mobilise the necessary actors and resources to create real life laboratories to investigate the optimal market penetration paths and the most sustainable alternatives. Projects will include socio-economic research into the interfaces between the new energy technologies and their markets, for example innovative policy packages, financing mechanisms and user/consumer acceptance.

Proposals addressing short-to-medium term research should comply with the following guidelines:

- Deliver results, which will accelerate the market penetration of innovative energy technologies with a particular emphasis on 2010 energy policy objectives.

[1] The word "research" used in the general sense refers to research, technological development and demonstration activities.

- Consist mainly of integrated demonstration actions with an optional research component of up to about 20%, including, where appropriate, pre-normative research and energy technology integration.
- Include a dissemination component (an innovation related activity).
- The risks to be addressed are mainly technological and might include market related and financial issues.
- Demonstrate reductions in the costs associated with implementation of new technologies and/or demonstrate how innovative technological solutions can be integrated under full-scale operating conditions.
- Provide inputs for the future development of energy policy and legislation, including the improvement of existing regulatory measures, whilst serving EU research and related policies.

The research components of short to medium term projects should adopt a multidisciplinary approach, including, where appropriate, socio-economic research on the future policy, market and end user impacts of the innovative energy technologies involved, in addition to technology focused research.

Research activities having an impact in the medium to long term

The medium to long term research objective is to develop new and renewable energy sources, and new carriers such as hydrogen which are both affordable and clean and which can be well integrated into a future sustainable energy supply both for stationary and transport applications.

The future large-scale development of these technologies will depend on significant improvements in their cost and other aspects of competitiveness against conventional energy sources. The overall socio-economic and institutional context in which they are deployed will be covered in a synergetic approach, which takes account of energy and other related policies.

Proposals addressing medium-to-long term research should:

- Deliver results which could be widely exploited commercially or otherwise, with a time horizon generally beyond 2010; further development and particularly demonstration type actions may be necessary before technologies are ready for full-scale commercial use.
- Consist mainly of research and development activities (including pre-normative and socio-economic research and the validation of technical and economic feasibility in pilot plants and prototypes), research-related networking activities, training and dissemination activities. The main risks to be addressed are scientific and technological rather than market and financial.
- Lead to the generation, exploitation and dissemination of new knowledge and contribute to the implementation of EU research policy, whilst also contributing to the development of energy and associated policies.

The research activities to be funded in the medium-to-long term should address not only the technological aspects, but also incorporate in a multidisciplinary approach the socio-economic research necessary to overcome the non-technical obstacles for the penetration into markets of the technologies concerned.

6.1.2.Objectives, Structure and Overall Approach

6.1.2.1. Implementation Principles

The Sixth Framework Programme (FP6) differs significantly from previous ones. A key difference is its role in contributing to the creation of the European Research Area (ERA) in sustainable energy systems. This means that the aim is to assemble a *critical mass of resources*, to *integrate* research efforts by pulling them together and to make this research more *coherent* on the European scale.

Focus on priorities – to ensure concentration of effort and maximise the impact of the Programme, it is intended to focus research on a limited number of priority topics. The response to the 2002 invitation to submit Expressions of Interest, together with other inputs on the strategic importance of research in certain key fields, has been used to define the content of the Work Programme and, particularly, to focus the first Calls for Proposals. However, it is strongly emphasised that the previous submission of an EoI will have no bearing on the evaluation of any proposal in subsequent calls for proposals.

Priority use of the new instruments – the Commission intends to use the new instruments (Integrated Projects and Networks of Excellence) as a priority from the start of FP6, depending upon the quality of proposals received and their relevance to the objectives of the Programme, whilst maintaining the use of the other types of instrument – Specific Targeted Research Projects, Co-ordination Actions and Specific Support Actions.

Selection of topics – approximately 890 Meuro is available for RTD on sustainable energy systems, spread over the four years of the Programme (2003-2006). Calls for Proposals will thus need to be selective as it will not be possible to fund all potential topics of interest within the priority areas identified in the Specific Programme. Furthermore, there may be competition between proposals both across and within research topic areas in each call, which may result in some topics not being supported.

6.1.2.2. Horizontal aspects to be taken into consideration by proposers

Proposals should follow the general guidelines for submission (see FP6 InfoPack). Important general information on cross-cutting issues is mentioned in the General Introduction to the overall Work Programme, complemented by the specific aspects related to energy below :

International scientific co-operation: Global international co-operation will be encouraged for research activities addressing the environmental consequences of energy policies, energy supply inter-dependency, and cross border energy and environmental issues. The focus will be on activities of mutual concern and synergy with other international programmes and initiatives such as those of the International Energy Agency. Activities will therefore be encouraged in the form of:

- initiatives aimed at securing a leading role for Europe in international research efforts on global sustainable energy issues;
- integrated bilateral co-operation activities in sustainable energy research with third countries or groups of third countries;
- participation of third country researchers and organisations in sustainable energy research projects and networks in areas of common interest.

Cross-cutting dimension in energy research: The technologies covered by this work programme are often integrated into systems combining several of them for different applications e.g. fuel cells and hydrogen, renewable energy sources in combination with

reversible fuel cells and hydrogen, hydrogen production and CO_2 sequestration, advanced hybrid systems integrating fuel cells with conventional technologies etc. Such combinations can lead to important synergies and proposals developing such approaches can be envisaged. The integration of different renewable energy technologies into supply and distribution networks, together with energy demand management, is of particular interest (see section 6.1.3.1.1.2).

6.1.2.3. Modalities for implementation

This part of the work programme will be implemented using Integrated Projects (IP), Networks of Excellence (NoE), Specific Targeted Research Projects (STRP), Co-ordination Actions (CA) and Specific Support Actions (SSA), as indicated in the Roadmap (Table 1).

Proposals for Integrated Projects and Specific Targeted Research Projects can be for research and technological development projects, demonstration projects or a combination of the two. For research and technological development activities, STRPs should be focused on specific topics of an exploratory and/ or high-risk innovative nature.

Proposals for Co-ordination Actions should preferably be new initiatives for the networking and co-ordination of research and innovation activities in areas of interest for the programme. If successful, the outcome of such actions could, in due course, form a basis for future IPs or NoEs.

The purpose and nature of Specific Support Actions is described in the General Introduction to the overall Work Programme. They will include actions to stimulate, encourage and facilitate the participation of organisations from the candidate countries in the activities of the priority thematic areas, in particular via the Networks of Excellence and Integrated Projects.

Further information on all of the above instruments, including levels of funding, and the issues expected to be addressed in proposals are contained in the FP6 InfoPack.

In addition, where appropriate, the Commission will issue Calls for Tender for specific studies or services required to achieve the programme objectives, particularly with regard to the promotion and dissemination of results. A list of studies planned for 2004 for the medium-to-long term part of the programme is shown in the table below.

The Commission will participate in selected tasks of Implementing Agreements managed by the International Energy Agency, making financial contributions as appropriate, where this is in the interests of the Community.

Studies planned for the M-L term part of the WP in 2004:

Study	**Status**	**Budget**	**Expected duration**
Portfolio analysis of European Community non nuclear energy RTD projects in their overall EU context	Published in OJ, ToR being sent to applicants.	Approximately 150.000 €	8 months
Comparative Study of mechanisms, results and good practices in terms of Innovation and Transfer of results of energy RTD in national and Community's programmes.	To be launched in second semester of 2004	Approximately 150.000 €	8 months
Assessing present achievements and future potential for increased co-operation between New Member States, Candidate Countries, other Associated States and the	To be launched in second semester of 2004	Approximately 30.000 €	6 months

EU in energy RTD			
Perspectives of cooperation between Europe and China on energy RTD; issues and recommendations.	To be launched in second semester of 2004	Approximately 35.000 €	6 months

6.1.3.Technical Content

The sustainable energy systems work programme will be implemented in two complementary parts – RTD activities having the potential for exploitation in the short to medium term and those which are expected to have an impact in the medium to longer term. The differing characteristic profiles of the activities expected to be supported in each part of the programme are explained in Chapter 6.1.1. Co-ordination between the two parts will be ensured.

6.1.3.1. Research activities having an impact in the short and medium term

In accordance with the principle of focusing research effort, the following sections 6.1.3.1.1 to 6.1.3.1.3 describe the main objectives to be achieved and the strategically important areas in which research should be concentrated. These sections are followed by sections 6.1.3.1.4 and 6.1.3.1.5, which contain details of the priorities for the third call (Call 2005.SM), and the fourth call (Call 2006.SM).

6.1.3.1.1. Clean energy, in particular renewable energy sources and their integration in the energy system, including storage, distribution and use

6.1.3.1.1.1. Cost-effective supply of renewable energies

[Activity Code : SUSTDEV-1.1.1]

Actions should be aimed at bringing the next generation of more cost-effective renewable energy technologies to the market, with particular emphasis on markets in Europe. The results should enable these technologies to compete in the liberalised energy markets of the future with substantially reduced levels of subsidy, and also help to bring them within reach of developing countries. The main tasks to be carried out will explore ways to reduce the costs of the energy delivered by specific renewable energy technologies, in the form of *green electricity, heating/cooling, and liquid/gaseous biofuels*.

Electricity from biomass and/or waste derived fuels including solid as well as liquid resources e.g. black liquor, and waste recovered fuels (including the biodegradable fraction of Municipal Solid Waste) or effluents e.g. sludge. Projects should focus on one or more of the following: o*ptimisation of the fuel supply chain* taking into consideration all aspects of fuel production (in case of dedicated energy crops and short rotation forestry) and preparation of the fuel to high standards and specifications; c*ombinations with fossil fuels* designed to guarantee the continuous supply of electricity to final users, such as advanced co-firing and co-combustion; *innovative technologies for large scale electricity generation,* such as integrated gasification combined cycle plants, dedicated gasification to power plants, biomass boilers, flash pyrolysis applications where the emphasis is placed on achieving high conversion efficiencies and high reliability of the technology.

Electricity from wind : projects should focus on one or more of the following: i*nnovative wind farms, turbines, and components* for reliable electricity generation at reduced costs; *design tools* including advanced modelling of large turbines and the corresponding site assessments, that facilitate a move towards design limits, new design principles and materials, including more realistic load assumptions for a new generation of machines; *Actions aiming to facilitate the large scale deployment* of wind energy in unconventional sites including offshore, extreme climates, and complex terrains.

Electricity from photovoltaics. Priorities to be addressed are: *Innovative manufacturing concepts* for high efficiency PV cells/modules to be integrated into larger scale (multi-MW) photovoltaic production facilities in order to lower the Wp cost; and including low cost integrated components or devices for grid connected or stand alone PV generators; Actions aimed at *kick-starting Si-feedstock production by EU industries* to secure a reliable and affordable supply for fostering PV cell cost reductions; *Transfer to industrial scale* of a new generation of PV technologies / products to facilitate the integration of innovative solutions at lower costs; *Large area, low cost photovoltaic modules for building integrated PV (BIPV)* including architectural roof integration, and *autonomous solar electricity generation systems* in industrialised and developing countries; *Integration of photovoltaic installations* in generation schemes to feed local distribution grids, closer to the point of use and development of new devices and systems to manage these installations.

Electricity from other renewable energy sources - projects should focus on one or more of the following: *Solar thermal power* for the large scale generation of electricity using power tower, trough or dish technologies, delivering reliable supplies of electricity to the grid at competitive prices; *Geothermal energy* for electricity generation and/or combined heat and power (CHP) generation employing innovative, environmentally sustainable and cost competitive technologies; *Small-scale hydro power plants,* for electricity generation with reduced costs, acceptable environmental impacts and competitive performance; *Ocean energy technologies,* including wave, ocean current and tidal technologies, which are ready for demonstration at full scale with a view to commercial exploitation.

Heat/cooling from renewable energy sources: projects should focus on one or more of the following : *Heat from biofuels and/or waste derived fuels,* including applications in industry and in buildings, as well as CHP, either individually or with district heating. Preference will be given to novel systems that utilise liquid or gaseous biofuels; *Solar heating and cooling* based on a new generation of solar water heating, solar space heating and/or cooling systems*, or* "combi-systems", which are designed for large scale production with improved performance and reduced costs*; Solar industrial process heating or solar desalination systems* with improved performance at competitive costs; *Geothermal energy for heating and cooling* employing innovative environmentally sustainable and cost competitive technologies, including ground coupled heat pumps.

[NOTE: Priorities in the 3rd and 4th SMT Calls for Proposals are presented in sections 6.1.3.1.4 and 6.1.3.1.5.]

6.1.3.1.1.2. Large-scale integration of renewable energy sources into energy supplies

[Activity Code : SUSTDEV-1.1.2]

Short / medium term research on the large scale integration of renewable energy sources into energy supplies is needed in support of the EU's commitments to increase the percentage of renewable energy sources to 12% of final energy consumption and 21% of final electricity consumption by 2010. At the same time, the EU is committed to major reductions in energy intensity and this will require substantial increases in the adoption of innovative technologies for the management of energy demand.

The demand for electricity is expected to grow significantly over the next decade, but the liberalisation of the energy market has lead to a significant reduction in the installed over-capacity of base load power plants. In some EU countries the demand for electricity peaks more often in summer than in winter, due to a very significant increase in the demand for cooling. In a growing number of regions the low voltage distribution network to the end users shows weaknesses. Some of these problems can be addressed by installing medium

and small scale power generation units, including renewable electricity generating plants, in strategic locations to stabilise the grid instead of installing new power lines.

Research on the large scale integration of renewable energy sources into existing energy supplies and networks should therefore address the inevitable and dynamic interactions between centralised and decentralised energy supplies and demands at the systems level, which is typically more complex when advanced energy management systems are employed. In this context, priority will be given to actions which contribute to a better understanding of the potential problems and solutions associated with enhanced distributed generation in existing grids, including hybrid systems and different levels of renewable energy integration, (including storage where applicable) into electricity and heat distribution grids, networks and related end-use applications.

Amongst the approaches to be adopted, the large scale integration of renewable energies should be demonstrated in clearly defined geographical areas or zones (real life laboratories), within which all of the relevant energy flows (supply and demand) can be identified, measured and assessed. Such projects are expected to involve communities together with local industries, agencies, and utilities in cities, towns and rural areas (including islands), which are committed to integrating renewable energy sources (RES) and efficient demand management technologies in a comprehensive and innovative way into their local energy economies.

Projects addressing the large scale integration of renewable energies should adopt innovative technical approaches to the production, storage, integration and use of RES electricity, RES heating and cooling and liquid and gaseous biofuels, as explained below:

RES electricity, such as wind, biomass and wastes, solar PV, geothermal, and hydro, including where appropriate the integration of *decentralised or distributed electricity generation* at different network voltage levels with intelligent demand side management programmes, local energy management techniques and the co-ordinated provision of sustainable energy services with a high degree of local autonomy and supply security; e*lectricity storage systems* including advanced batteries, hydrogen and other electricity storage devices either for supplying short-term peak demands or for balancing variations in renewable electricity supply, as well as innovative socio-economic approaches to integrated energy planning, leading to local policies, codes, and regulations;

Medium and low temperature RES heating and cooling, such as locally optimised schemes for providing heating and cooling from solar, geothermal and biomass sources in buildings and industry, and establishing advanced distribution systems (district heating and cooling networks) with integral storage systems as appropriate;

Liquid and gaseous biofuels and recovered fuel production and processing on a commercial basis and their use in buildings, industry and transport.

[NOTE: Priorities in the 3rd and 4th SMT Calls for Proposals are presented in sections 6.1.3.1.4 and 6.1.3.1.5.]

6.1.3.1.2. Energy savings and energy efficiency, including those to be achieved through the use of renewable raw materials

The overall objective is to substantially contribute directly or indirectly to the EU targets of (1) reducing energy intensity by 18% for the year 2010, (2) achieving a *global indicative community target of 18% of electricity consumption from co-generation by the year 2010,* (3) doubling the share of renewables from 6% to 12% for the year 2010 and (4)

contributing to achieving the objectives of the internal market for energy, and (5) the policy of security of energy supply. Projects should also make a concrete input to the European Climate Change Programme.

The demand for cold (including air-conditioning, refrigeration, and freezing) has grown exponentially all over Europe in industry, residential and commercial buildings. This trend is expected to continue in the next years, and to penetrate also the market for private houses. Cooling and freezing are usually very energy intensive, and, if nothing is done, this predicted growth may annihilate all efforts of energy savings in buildings and industry, as targeted in the directive on the energy performance of buildings and in the green paper on security of energy supply. Today many new tertiary buildings are equipped with air conditioning, although appropriate eco-building design could have avoided the need to install air conditioning systems in the first place.

6.1.3.1.2.1. Eco-buildings

[Activity Code : SUSTDEV-1.1.3]

The building sector is at present responsible for more than 40% of EU energy consumption. There are technologies under development, which could substantially improve (up to 30%) the energy performance of buildings, reducing the conventional energy demand in new and existing buildings and substantially contributing to reduce energy intensity, through combined measures of rational use of energy and integration of renewable energy technologies.

The Eco-buildings concept is expected to be the meeting point of short-term development and demonstration in order to support legislative and regulatory measures for energy efficiency and enhanced use of renewable energy solutions within the building sector, which go beyond the draft Directive on the Energy Performance of Buildings.

The projects aim at a new approach for the design, construction and operation of new and/or refurbished buildings, which is based on the best combination of the double approach: to reduce substantially, and, if possible, to avoid the demand for heating, cooling and lighting and to supply the necessary heating, cooling and lighting in the most efficient way and based as much as possible on renewable energy sources and polygeneration.

Priority will be given to integrated research and demonstration projects aiming at improving substantially the energy performance of buildings at a large scale, transferring scientific knowledge into standards and industrial codes, and including the results of socio-economic research on integrated planning and behaviour of users. The projects must go clearly beyond the requirements of existing legislation and thus contribute to a further development of regulatory issues in this sector.

In setting this new approach, the integrated projects should bring together different skills and expertise (urban planners, architects, engineers, system integrators, investors, manufacturers, industry, energy suppliers, owners renters, etc), take advantage of advanced communication and information tools, and propose new methodologies and techniques.

[NOTE: Priorities in the 3rd and 4th SMT Calls for Proposals are presented in sections 6.1.3.1.4 and 6.1.3.1.5.]

6.1.3.1.2.2. Polygeneration

[Activity Code : SUSTDEV-1.1.4]

There is a growing awareness within the framework of the ongoing liberalisation of the energy industry, that an integrated approach to energy supply, distribution and demand management is required. For polygeneration, proposals should focus on market oriented projects involving innovative applications of energy technologies and advanced energy services, and take into account non-technological barriers such as legislative and regulatory measures. They should include EU wide dissemination of results.

Polygeneration applies to projects that improve the efficiency of an overall system covering supply and demand. It therefore covers the complete spectrum from primary energy sources to energy services for private or industrial consumers. Projects should demonstrate the supply of primary energy sources to the project site, their conversion to energy, the supply and distribution of the energy produced, the provision of energy services to consumers and the eventual production of energy carriers (such as biofuels or hydrogen), or other useful products.

Projects that aim to demonstrate the development of individual energy system components such as boilers, gas turbines, fuel cells etc *in isolation*, are considered product development projects and therefore are NOT covered by this call.

Strategic objective:
Polygeneration is the combined production of useful electricity with heat, cold, and other useful products. It encompasses conventional co-generation (combined heat and power, CHP), tri-generation (of power, heat and cold) as well as technologies for producing fuels, chemicals and other value-added products together with the basic energy amenities. Polygeneration systems may use a wide range of fossil and renewable primary energy sources. Their main benefit is in maximising the overall efficiency of the integrated system near to the point of use. Polygeneration combined with efficient district heating and cooling may provide added benefits to a larger community. Secondary benefits may include improved reliability of the supply and distribution networks, arising from better interaction between producers and distributors.

The overall objective is to support projects which will aim to reduce the demand for primary energy by at least 30% (by 2010) compared to standard commercial applications in 2003, by improving the efficiency of providing electricity, heating and cooling services in parallel to the end users.

Reductions in energy consumption contribute to combating climate change and enhance the security of energy supply. More specifically, “Polygeneration” actions should support the Cogeneration Directive and contribute to the Community target of doubling the share of cogeneration in EU electricity generation to 18% (by 2010).

Projects should deliver results that facilitate the short to medium term implementation of policy, legislative and regulatory measures in the energy fields mentioned above for increasing the global energy efficiency through an appropriate integration of supply and demand. The Directive on energy performance of buildings, which has to be transposed before beginning of 2006, includes provisions ensuring that alternative systems such as decentralised energy supply systems, CHP, district heating/cooling systems have to be considered for new buildings. Projects also may develop appropriate tools such as demand and supply monitoring systems that may assist the implementation of this Directive.

Projects should also aim to improve the energy intensity in end use sectors, for example in residential houses, tertiary buildings, and buildings with public access, as well as

industries, businesses and industrial parks. Polygeneration systems, which are appropriately integrated in the end use application, should lead to an important energy efficiency increase of the overall system. They could also demonstrate the integration of renewable sources and allow substantial reductions in installation / operating / maintenance costs.

Applications of Polygeneration:

Projects should concentrate on the demonstration of innovative pre-commercial technologies in market oriented actions, and with short to medium term exploitation prospects, addressing one of the following applications:

1) Polygeneration for residential and commercial buildings, district networks and the tertiary sector. Emphasis should be placed on measures to improve operating efficiency, security, reliability of performance at reduced costs and a large reduction of green house gas emissions.

2) Polygeneration for industrial applications with significant improvements on energy efficiency.

Projects should be demand driven and should have short to medium term exploitation prospects. In particular, they should demonstrate how new and emerging knowledge in the area can be optimised in concrete cost effective applications. Priority will be given to projects that:

- focus on novel heating or cooling solutions, innovative energy storage and load management (where applicable),
- include a significant RES contribution (the inclusion of RES in the proposals is not essential but highly desirable, and in case of proposals of equal merit priority may be given to those proposals that include RES),
- address in particular the situation in countries and regions where the potential for improvement and better utilisation of existing district heating infrastructure is significant, for example in some of the new EU Member States.

Expected results:

a) Demonstration of systems that are more competitive than conventional ones through higher system efficiencies (for example plus 30%), strengthening of the supply and distribution network at strategic points, compensating higher capital cost, and ensuring shorter pay back time;

b) Innovative integration of polygeneration systems for buildings and industrial applications so that the overall increase in the energy efficiency of the polygeneration system is achieved in a cost-effective way (short pay-back period);

[NOTE: Priorities in the 3rd and 4th SMT Calls for Proposals are presented in sections 6.1.3.1.4 and 6.1.3.1.5.]

6.1.3.1.3. Alternative motor fuels

[Activity Code : SUSTDEV-1.1.5]

Despite all efforts at the European, National, Regional and Local levels, greenhouse gas emissions from energy used in transport continue to grow. In addition, the transport sector remains almost exclusively dependent on oil. Activities under this heading of the work programme should contribute to the mitigation of both greenhouse gas emissions growth, over-dependence on oil and the promotion of biofuels for transport applications.

The Commission has suggested a policy objective of 20% petrol and diesel substitution by new/alternative fuels in road transport by 2020[2]. In the 2001 Commission Communication[3] on Alternative Motor Fuels three types of alternative motor fuels that could contribute to EU energy policy objectives were identified: *biofuels*, *natural gas* and *hydrogen*.

The Alternative Motor Fuel policy of the European Commission has given priority to ***liquid and gaseous biofuels*** in the short and medium term. Technically they are useable, according to existing legislation, either in low blends (<5%), or unblended (100%) in dedicated engines. Their introduction in the market is supported by Directive 2003/30/EC of 07.05.2003 that set indicative targets of 2% and 5.75% market shares for biofuels respectively for the years 2005 and 2010 as well as by Directive 2003/96/EC of 27.10.2003, which allows for their de-taxation up to 100% by the Member States.

At present the **production** of biodiesel from seeds (such as rape and sunflower), bioethanol from starch (such as wheat or corn) or sugar (such as sugar beet) and biogas from effluents and organic waste streams (such as sewage sludge) is well demonstrated and the various processes are considered reliable and therefore industrial. However, there are new technologies being developed such as the production of biodiesel from animal tallow, and ethanol from lignocellulosics that require full scale demonstration in order to prove their technical and economic viability. The biomass gasification to synthesis gas route (biomass to liquid, BTL) has also attracted renewed interest although the technical hurdles still need careful attention before full scale demonstration can be achieved and several research projects have recently been initiated and supported under the first call of the sixth framework programme.

In the **market** biofuels face obstacles related to the low blend limitations and differences in their nature compared with petrol and diesel often give rise to problems such as increased volatile evaporative emissions or engine parts deterioration. However, options like BTL fuels face less demand side obstacles because there are no blending restrictions. Higher ethanol blends such as 10% (as in the USA) and 25% (as in Brazil) are widely applied by the industry and the market in some countries due to the use of dedicated vehicles. Pure ethanol is also in use in Brazil and has recently received high impetus. Fuel flexible vehicles using an 85% ethanol blend are widely introduced in both the USA and Brazil and have been used successfully since 2002 in Sweden. In the EU the use of unblended biodiesel has been demonstrated in captive fleets - mainly buses but also agricultural tractors. Buses have also been operated with diesel-ethanol blends and pure ethanol in large-scale projects in Sweden for more than 10 years.

Recent developments in the global political arena are pushing **hydrogen** beyond the usual research circles. The European Commission established a High Level Group on Hydrogen and Fuel Cells in 2002 that presented its conclusion in the form of a vision report at a European Conference in June 2003 (http://europa.eu.int/comm/research/energy/pdf/hydrogen-report_en.pdf). Following the recommendation of the High Level Group the European Commission has now created a European Hydrogen Technology Platform which aims at accelerating the development of the Sustainable Hydrogen Economy. On the international front, the recently created International Partnership for the Hydrogen Economy signed in November 2003 by 16 governmental partners, provides a framework for global cooperation, including developing countries.

[2] European Commission Green Paper: "Towards a European Strategy for the Security of Energy Supply". COM (2000) 769

[3] COM (2001) 547. Commission Communication on Alternative Motor Fuels

All these initiatives acknowledge that hydrogen demonstration activities are a key priority to guide and advance the research and deployment efforts on the path to a future hydrogen economy.

Within the European Union several demonstration initiatives and projects aiming to use ***hydrogen as a transport fuel***, or in general as a new energy vector, are currently being implemented, including demonstrations of hydrogen fuelled fuel cell buses and cars and the corresponding fuelling and maintenance infrastructure. Major cities like Berlin, London, or Grenoble and regions like Lombardia, or Baden-Württemberg have also shown their commitment to develop the hydrogen economy.

The short to medium term research programme will concentrate on large-scale demonstration initiatives designed to identify and assess ways to remove existing technical, commercial, operational, organisational, and institutional barriers, which prevent alternative motor fuels and energy efficient vehicles from significantly entering the market.

The whole Well to Wheel chain should be taken into account and optimised to decrease energy losses and bring costs down to competitive levels. The final aim would be to demonstrate the environmental and societal benefits of these alternatives and to widely spread knowledge about them that would increase and ensure their progressive acceptance.

In cities, and in general in urban areas, it is easier to set up a new/alternative distribution and refuelling infrastructure for demonstration of alternative fuels and energy efficient vehicles. Furthermore, in cities the impact of such demonstration projects is much greater. Therefore, these large-scale initiatives should include demonstrations in cities of vehicle fleets[4] and of their supply and fuelling infrastructure. The scale of the activities should allow the assessment of the alternative fuel pathways in real life environments. Research on socio-economic, public acceptance and dissemination aspects would also be part of the initiatives.

Application driven research and large scale demonstration working on both the supply and demand sides, will deliver a better understanding of the organisational, institutional and financial frameworks required to successfully introduce innovative solutions and bold changes aiming at the reduction of oil dependency and greenhouse gas emissions in road transport.

Relevant and interested stakeholders should become part of European partnerships that will implement these innovative demonstrations of alternative fuels and energy efficient vehicles. The key stakeholders are city and regional authorities, working closely together with fleet operators, vehicle and equipment manufacturers, technology providers, fuel and feedstock suppliers and researchers.

Priority will be given to projects integrating the following topics:

- *Demonstration of alternative fleets;*
- *Demonstration of innovative, energy efficient, cost-efficient and safe production, storage and distribution of alternative fuels;*
- *Demonstration of new ways of using alternative fuels in energy efficient vehicles;*
- *Assessment and monitoring of new and ongoing activities;*
- *Communication and dissemination*

[4] A vehicle fleet is considered a coherent group of at least three vehicles normally operated by a single operator. In addition, a fleet operates around a central point were specific fuelling and maintenance infrastructure is available.

Further information can be found on the following web site:
http://europa.eu.int/comm/dgs/energy_transport/rtd/6/index_en.htm.

[NOTE: Priorities in the 3rd SMT Call for Proposals are presented in sections 6.1.3.1.4 and 6.1.3.1.5.]

6.1.3.1.4. Priorities for 3rd SMT Call for Proposals (2005)

Research areas and topics for 2005 (Call 2005.SM)

Cost-effective supply of renewable energies:

[Activity Code : SUSTDEV-1.1.1]

a) Proposals for Integrated Projects (IP's) are invited for the following topics, which are described in section 6.1.3.1.1.1, within which priority will be given to the highest quality proposals and to actions aiming to accelerate growth in the production of renewable electricity :

Innovative combinations of biomass with fossil fuels for large scale supply of renewable electricity and / or CHP to final users at more competitive costs and/or increased energy efficiency, such as advanced co-firing and co-combustion; priority will be given to projects which address the whole supply chain for the biomass fuels including new energy crops (growing, harvesting, transportation and logistics), as well as local fuel handling technologies and innovative approaches to the use of combustion ash with a high fraction of biomass residues.

Innovative demonstrations of improvements to energy recovery and renewable electricity production using waste materials and other commonly available biomass feedstocks (biodegradable fraction of Municipal Solid Waste, Refuse Derived Fuels or biomass residues or a mixture of such feedstocks and other bioenergy materials) for large scale supply of renewable electricity and heating / cooling to final users at more competitive costs and improved environmental parameters, such as: advanced combustion / incineration technologies, advanced fuel handling, advanced treatment of exhaust gases and residues. Priority will be given to proposals demonstrating an integrated approach, which covers the whole supply chain (feedstock preparation, transport logistics, conversion and waste recovery), innovative technologies with high yields (energy to electricity conversion), and using readily available raw and residual material in an efficient way.

b) Proposals for Specific Targeted Research Projects (STREPS's) are invited in the following areas (described in section 6.1.3.1.1.1), within which priority will be given to the highest quality proposals and to actions aiming to accelerate growth in the production of renewable electricity :

Innovative approaches to improving the yield of medium to large scale biogas plants at competitive costs, for example by advanced process design, management systems and process monitoring (advanced automation systems), measurement or control techniques, innovative up-scaling, improved environmental performance; priority will be given to projects which address the whole supply chain, including the integration of several waste streams and the maximisation of renewable electricity and heat production at more competitive costs (reduced plant investment and operating costs).

Innovative combinations of biomass and wastes with fossil fuels for large scale supply of renewable electricity to final users, such as advanced co-firing and co-combustion;

Innovative wind farms, components and design tools for reliable electricity generation at reduced costs using either onshore or offshore installations, with particular emphasis on issues related to low wind speeds, extreme load cases, complex terrains, advanced micro-siting techniques, and micro-climates;

Innovations in PV manufacturing plant at an industrial scale, which demonstrate integrated solutions for mass producing solar PV cells and modules at lower costs;

Geothermal energy using innovative integrated systems with optimised efficiency and reduced costs for electricity generation, and / or combined heat and power (CHP), using environmentally sustainable technologies.

Ocean / marine energy technologies, including wave, ocean current and tidal stream technologies, which are ready for demonstration at full scale with a view to commercial exploitation .

c) Proposals for Co-ordination Actions (CA's) and Specific Support Actions (SSA's) are invited in the areas described in Section 6.1.3.1.1.1.

Grid issues

[Activity Code : SUSTDEV-1.1.7]

Building on the recent work carried out in these fields in the context of medium to long term research actions, proposals for Specific Targeted Research Projects (STREPs), Coordination Actions (CA's) and Specific Support Actions (SSA's) are invited in the areas of the large scale integration of renewable energy sources, described in Section 6.1.3.1.1.2 and Polygeneration described in section 6.1.3.1.2.2. In particular, support is envisaged for :

Distributed generation: research and demonstrations aimed at maintaining the stability of the electricity grid as the installed capacity of distributed generation using RES and/or polygeneration is increased. Priority will be given to actions aimed at demonstrating the optimal use and management of distributed generation and storage to address existing and potential bottlenecks, achieve an increase in the security of distribution grids, improve the ability of the grid to meet peak demands, improve the stability of the grid, or improve the overall management of the grid thus saving the costs of conventional reinforcement. Demonstration actions should be implemented by market actors which are responsible for distribution grids, together with end users where appropriate, using medium and small scale CHP and RES electricity generators. *[N.B. see also section 6.1.3.2.2 of this Work programme for research activities having an impact in the medium and longer term.]*

Management of electricity grids linked to large scale decentralised wind power generation: research and demonstrations addressing the design and management of electricity grids linked to large scale decentralised wind power generation. Priority will be given to strategic research actions (including system output forecasting) aimed at addressing the intermittency of wind power generation, and to demonstrations of innovative control technologies, intelligent management systems (with related information technologies), and / or storage, which address the large scale transmission of renewable electricity at trans-regional or EU level. Actions should be implemented by consortia involving organisations (market actors such as transmission system operators, developers, and manufacturers), which are responsible for the regulation, development and management of high voltage transmission networks, supplied by large scale on- or off-shore wind farms.

Polygeneration

[Activity Code : SUSTDEV-1.1.4]

Proposals for Integrated Projects (IP's) and Specific Targeted Research Projects (STREPs), are invited in the areas of ***Polygeneration,*** described in section 6.1.3.1.2.2. In particular, support is envisaged for:

Improvement of the competitiveness of Polygeneration

Objectives and problems to be solved: Improve the competitiveness of polygeneration in all applications through the demonstration of innovative technologies or innovative combinations of existing technologies.

Work to be done: Demonstrate innovative technologies with short and medium term exploitation. A flexible multi-fuel approach should be supported, including renewable fuels and waste and the development of advanced energy services at lower costs.

Expected results: Projects should lead to the efficient combined production and use of electricity, heat, cold, energy carriers (such as biofuels or hydrogen), or other useful products.

Innovative integration of polygeneration

Objectives and problems to be solved: Proposals should aim at improving the innovative interaction between suppliers of electricity, heat, cold, energy carriers or other useful products and the corresponding demands. They should lead to an overall improvement in energy efficiency, in the cost-benefit rate of the project, and in the quality and security of supply.

Work to be done: Demonstrate in specific pre-commercial applications the integration of the supply and demand chain for polygeneration installations connected into supply and distribution networks.

Expected results: New technologies, (pre-standardisation work), and innovative community energy management systems should make the connection of polygeneration plants more attractive to network operators. Fuel flexibility (including renewables) and improvements in operation and maintenance should increase the attractiveness of polygeneration in the decentralised energy market.

Alternative motor fuels

[Activity Code : SUSTDEV-1.1.5]

Proposals for Integrated Projects (IP's), Specific Targeted Research Projects (STREPs), and Coordination Actions (CA's) are invited in the areas of Alternative Motor Fuels**,** described in section 6.1.3.1.3.

The primary aim of this Call is to establish European partnerships for innovative demonstration of alternative fuels and energy efficient vehicles. In particular, one in the field of biofuels (European Partnership: **Biofuel-Cities**) and a second one in the field of hydrogen (European Partnership: **Hydrogen for transport**). These Partnerships could be composed of new projects financed by this call as well as on-going projects. The two Partnerships will be supported by Coordination Actions as described below. Each Partnership will constitute a coherent set of demonstration activities conducted through integrated projects and specific targeted research projects. In order to achieve this coherence, high quality projects may be clustered.

Biofuel-Cities

The **purpose** of Biofuel Cities is to demonstrate the use of new and innovative technologies that will permit extensive use of biofuels in cities covering the complete chain from feedstock to biofuels production, distribution and utilisation in vehicle fleets. The use of biofuels should focus on petrol or diesel blends higher than the present 5% biofuels so that such high blends or pure biofuels will be demonstrated at European scale. Projects should involve the issue of how to motivate end users and citizens to use biofuels for example through their local authorities and other local stakeholders.

All the new projects will be part of Biofuel Cities, in order to coordinate efforts and actively contribute to reaching the targets of Directive 2003/30/EC. Existing demonstration projects on biofuels production will be encouraged to join this Partnership.

Three types of proposal are invited:

- Priority will be given to Integrated Projects (IPs) that would address all the four topics a-b-c-d described below embracing all the links of the Well to Wheel chain.

- Proposals for Specific Targeted Research Projects (STREPs) are invited for innovative biofuels production demonstrations (topic b-c-d, as below).

- Proposals for a Coordination Action (CA) are invited to provide a coherent link between the resulting IPs and STREPs from this call and other on-going initiatives and other European Union supported projects in the biofuels field. This horizontal action should develop the European Partnership for the demonstration of biofuels technologies in Europe, providing a framework for dissemination of results and active communication. It should also include an independent common assessment[5] and monitoring framework of the projects from a socio-economic, energy efficiency, environmental and safety perspective.

Topics:

a.- Demonstration of ***alternative motor fuel vehicle fleets*** such as: buses; post distribution; waste collection; taxis; local delivery; airport fleets; and passenger vehicles. These fleets should demonstrate ***new ways of using biofuels in energy efficient vehicles***, with particular attention to high blends of bio-fuel (higher than 5%) and also the use of pure bio-fuels fleets. Introduction of innovative energy efficient concepts such as the combination of electric hybrid technologies with high blends of biofuels will be given priority. However, work on wholly electric vehicles will not be supported.

b.- ***Innovative, energy efficient, cost-effective and safe large scale production, storage and distribution of biofuels*** that could supply fuel to the abovementioned demonstration fleets.

c.- ***Assessment and monitoring*** from the perspectives of socio-economic, energy efficiency, environmental and safety perspective.

d.- ***Communication and dissemination.***

Hydrogen for transport

Following the Growth Initiative[6], the European Council of 12 December 2003 invited the European Commission to implement public private partnerships and to orient projects and funds in the field of hydrogen towards the priorities identified in the Quick Start Programme, namely hydrogen production and use in communities.

The purpose of this call for hydrogen is two fold:

- to coordinate under a single and coherent initiative (instrument: Coordination Action, CA), in the form of a European Partnership[7], the projects resulting from this call. In order to optimise the current effort the most important on-going demonstration projects and initiatives in hydrogen for transport will be invited to join this partnership. It should provide European and Global visibility to the projects and to their results. This European Partnership should also provide an independent common assessment[8] and monitoring framework of the projects from a socio-economic, energy efficiency, environmental and safety perspective. Finally, in view of future very large scale hydrogen demonstrations, this Partnership will prepare the ground for such initiatives

[5] For this assessment framework the CA will build on the work developed by on-going projects

[6] COM (2003) 690. Commission Communication on a European initiative for growth investing in networks and knowledge for growth and jobs. It includes the so-called "Quick Start programme".

[7] The Hydrogen for Transport European Partnership will be part of the European Hydrogen Technology Platform.

[8] For this assessment framework the CA will build on the schemes developed by on-going projects

in close coordination with the IP resulting from the joint Call on coordination, monitoring and assessment of research on hydrogen that also aims at preparing future activities.

- to supplement existing efforts with new Integrated Projects (IPs) addressing the priority topics (a-b-d-e and when relevant c) of this section embracing all links in the Well to Wheel chain:

a.- ***Demonstration of hydrogen fleets***. Priority will be given to innovative captive fleets that complement, from a technology point of view, technologies currently under demonstration in Europe, for instance hybrid fuel cells buses. Appropriate fleets could be: buses; post distribution; waste collection; taxis; local delivery; airport fleets; and passenger vehicles.

b.- ***Demonstration of innovative, cost-efficient and safe production, storage, distribution and fuelling systems of hydrogen.***

c.- *Exploring **synergies** between sector and technology pathways. Demonstration of the benefits for **transport and stationary** applications of using hydrogen simultaneously for both cases. Demonstration of the potential benefits of linking **biofuels and hydrogen** technology pathways.*

d.- ***Assessment and monitoring*** from a socio-economic, energy efficiency, environmental and safety perspective.

e.- ***Communication and dissemination.***

Thematic Promotion and Dissemination

[Activity Code : SUSTDEV-1.1.8]

Proposals for Specific Support Actions (SSA's) are invited for the promotion and dissemination of the results of international, national, and / or other actions in all of the areas described in Sections 6.1.3.1.

The promotion of renewable energy supplies together with the efficient management of energy demand and alternative motor fuels, should lead to well integrated, efficient and cost effective solutions for reducing the dependency of the EU on conventional fuels.

The actions proposed here should not replace the dissemination which is carried as part of each individual FP6 project, but should use the combined results from different projects as the basis for a thematic approach to promotion and dissemination.

The actions proposed here should be based mainly on promoting and disseminating the results of technology research and demonstration projects, including any lessons learned concerning the policy and legislative context in which they were implemented. Actions which are designed mainly to tackle non-technological market barriers should be proposed to the Intelligent Energy – Europe programme. Together, these two programmes act as an incubator for the policies and measures that promote renewable energy technologies and the rational use of energy in the EU.

In particular, support is envisaged for actions which address :

Renewable electricity technologies, for use in large scale grid connected applications, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on the promotion of electricity from renewable energy sources (2001).

Renewable heating and cooling technologies, for applications in buildings and industry, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example in the White Paper on renewable energy sources (1997).

Production and distribution of liquid and gaseous biofuels, for applications in buildings and transport, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directives on Biofuels (2003).

Eco-buildings, for domestic and tertiary applications, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on the Energy Performance of Buildings (2002).

Polygeneration, for applications in buildings and industry, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on Cogeneration (2004).

Energy demand management and renewable energy supply in high performance communities , including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Green Paper on the security of energy supplies (2001).

Alternative Motor Fuels, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should be co-ordinated with the actions supported under the Biofuels Cities initiative, and set its messages in the context of the relevant EU policy and legislation, for example the Directives on Biofuels (2003).

6.1.3.1.5. Priorities for 4th SMT Call for Proposals (2006)

Research areas and topics for 2006 (Call 2006.SM)

Cost-effective supply of renewable energies:

[Activity Code : SUSTDEV-1.1.1]

a) Proposals for Specific Targeted Research Projects are invited in the following areas (described in section 6.1.3.1.1.1), within which priority will be given to the highest quality proposals and to actions aiming to accelerate growth in the production of renewable heating and cooling:

Demonstrations of innovative designs of automated biomass heating systems with substantially reduced capital costs for introduction to mass markets in the domestic and tertiary buildings sectors; priority will be given to innovative designs and systems which also permit the use of fuels with lower quality, (eg: pellets from agricultural by-products or wastes), whilst maintaining high emissions standards.

Solar heating and cooling based on a new generation of solar water heating, solar space heating and/or cooling systems, *or* "combi-systems", which are designed for large scale production with improved performance and reduced costs*;* solar industrial process heating or solar desalination systems with improved performance at competitive costs

Geothermal energy using innovative integrated systems with optimised efficiency and reduced costs for heating and cooling, using environmentally sustainable technologies.

Innovative wind farms, components and design tools for reliable electricity generation at reduced costs using either onshore or offshore;

Demonstrations of the next generation of PV technologies / products, including PV in buildings, which demonstrate innovative integrated solutions for supplying solar electricity at lower costs, and / or innovations in manufacturing plant aimed at mass producing solar PV technologies or products at lower costs;

Ocean / marine energy technologies, including wave, ocean current and tidal stream technologies, which are ready for demonstration at full scale with a view to commercial exploitation .

b) Proposals for Co-ordination Actions and Specific Support Actions are invited in the areas described in Section 6.1.3.1.1.1.

Eco-buildings

[Activity Code : SUSTDEV-1.1.3]

Proposals for Specific Targeted Research Projects are invited in the following area, described in Section 6.1.3.1.2.1.

In particular, support is envisaged for projects that focus on innovative technological solutions within the context of an holistic approach to the design and operation of new or retro-fitted buildings. Projects should demonstrate ambitious reductions in energy consumption compared with existing national targets, together with attractive payback periods.

Polygeneration

[Activity Code : SUSTDEV-1.1.4]

Proposals for Specific Targeted Research Projects are invited in the following area, described in Section 6.1.3.1.2.2.

In particular, support is envisaged for projects that focus on innovative technological solutions aiming to improve the competitiveness of polygeneration in all applications through the demonstration of innovative technologies or innovative combinations of existing technologies. Projects should address the interaction between suppliers of electricity, heat, cold, energy carriers or other useful products and the corresponding demands. They should lead to an overall improvement in energy efficiency, in the cost-benefit rate of the project, and in the quality and security of supply.

CONCERTO II

[Activity Code : SUSTDEV-1.1.6]

NOTE: The text presented below may be revised before this Call is launched, in the light of experience from the first Call for CONCERTO projects, and further information will be provided on the CORDIS and EUROPA web sites.

Proposals for Integrated Projects (IP's) are invited for support under the co-ordinated initiative "CONCERTO II", which is a joint initiative between the research activities of Large-scale integration of renewable energy sources into energy supplies, Eco-buildings and Polygeneration, described in sections 6.1.3.1.1.1, 6.1.3.1.1.2, and 6.1.3.1.1.3.

Objectives and problems to be solved:

The CONCERTO initiative should support research and demonstration focused on optimising the energy flows in local communities through the innovative integration of RE technologies into electricity distribution networks, district heating systems, and directly into energy demanding systems, with advanced thermal and electrical storage as well as improved management of energy demand, and on the measurement (including remote metering) and assessment of energy flows.

In addition, participation in a Concerto project should permit communities to demonstrate integrated sustainable energy solutions in the fields of energy efficiency and renewable energy sources, aiming at high quality energy services.

In order to substantially improve the overall performance of energy systems in new and / or existing communities, projects should in an integrated way :

- apply highly efficient energy saving measures, including appliance controls
- significantly increase the percentage of renewable energy supplies,
- integrate the self supply of renewables and polygeneration into eco-buildings.

Emphasis on communities:

Concerto is a major European initiative which will support the development of new and innovative technical solutions making local communities both sustainable and highly energy-efficient. Such communities should be in clearly defined geographical areas or zones (cities, towns, rural areas or islands), within which all relevant energy flows (including centralised and decentralised) can be identified for measurement and research / assessment purposes.

Composition of the Corsortia :

Each Concerto community needs a strong commitment from the relevant local authorities, as well as from the different local market actors and decision-makers. Typical Concerto project consortia will include local and regional authorities, utilities, energy service providers, energy agencies, energy research and analysis teams, socio-economists and energy users. Participation of communities in the New Member States is particularly encouraged, and the involvement of observer communities is welcomed.

Work to be done and ways for implementation:
In each community, politicians, planners, developers, industry and citizens should actively cooperate to optimise the sustainability of their energy flows, through

- innovative technologies and innovative technology integration schemes and
- appropriate integration of decentralised energy supplies, in particular from new and renewable energy sources as well as
- conscientious application of high performance and economically justified energy efficiency measures in end-use sectors.

Projects should also adopt, where appropriate, innovative approaches to polygeneration together with innovative energy management practices and advanced technologies in eco-buildings aiming at high quality indoor climates. Renewable energy source-based transport components may also be included.

Projects should involve the full menu of activities, typically including

- about 75-80% for demonstration (of the integration of RES and RUE technologies),
- up to about 20% for research on development and analysis of innovative technology integration schemes; technology and market/economic risk assessment; socio-economic analysis; and performance management, monitoring and optimisation of energy flows at the level of local communities
- about 5% for the promotion and dissemination of project results, including the involvement of "follower communities".
- training (optional)

Expected results
Projects are expected to produce well monitored field experience of energy flows (supply and demand patterns), in local communities having a high percentage of renewable energy supply, together with detailed information on the performance and reliability of the innovative energy supply and end use technologies involved. A socio-economic research component should analyse the local trends in energy costs, prices and savings, as well as the social impacts, quality and added values of the energy services provided. The projects are also expected to include analyses of technical and market risks, cost reduction potentials and future market potentials for the technologies and approaches adopted.

The results from such projects will demonstrate the high potential for improving the sustainability of energy systems in local communities, which can be achieved by addressing energy supply and demand with a fully integrated approach. They should also result in new "good practices", which can be used in the future as examples to raise the confidence of potential decision-makers, investors and final users.

In addition, the technical and socio-economic analyses from such projects, which integrate technology, social and economic aspects, will support the future development and implementation of energy policy, by providing well documented field experience which can be used as a basis for

- developing new regulations (e.g. for distributed electricity generation),
- improving the security of energy supplies in future energy markets,
- the further development of support schemes for RES and RUE technologies (e.g. feed in laws, green certificate schemes, energy taxation),
- planning guidance, and
- energy cost and price reductions.

Thematic Promotion and Dissemination

[Activity Code : SUSTDEV-1.1.8]

Proposals for Specific Support Actions (SSA's) are invited for the promotion and dissemination of the results of international, national, and / or other actions in all of the areas described in Sections 6.1.3.1.

The promotion of renewable energy supplies together with the efficient management of energy demand and alternative motor fuels, should lead to well integrated, efficient and cost effective solutions for reducing the dependency of the EU on conventional fuels.

The actions proposed here should not replace the dissemination which is carried as part of each individual FP6 project, but should use the combined results from different projects as the basis for a thematic approach to promotion and dissemination.

The actions proposed here should be based mainly on promoting and disseminating the results of technology research and demonstration projects, including any lessons learned concerning the policy and legislative context in which they were implemented. Actions which are designed mainly to tackle non-technological market barriers should be proposed to the Intelligent Energy – Europe programme. Together, these two programmes act as an incubator for the policies and measures that promote renewable energy technologies and the rational use of energy in the EU.

In particular, support is envisaged for actions which address :

Renewable electricity technologies, for use in large scale grid connected applications, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on the promotion of electricity from renewable energy sources (2001).

Renewable heating and cooling technologies, for applications in buildings and industry, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example in the White Paper on renewable energy sources (1997).

Production and distribution of liquid and gaseous biofuels, for applications in buildings and transport, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directives on Biofuels (2003).

Eco-buildings, for domestic and tertiary applications, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on the Energy Performance of Buildings (2002).

Polygeneration, for applications in buildings and industry, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Directive on Cogeneration (2004).

Energy demand management and renewable energy supply in high performance communities , including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should set its messages in the context of the relevant EU policy and legislation, for example the Green Paper on the security of energy supplies (2001).

Alternative Motor Fuels, including marketing campaigns and the dissemination of results from new technology demonstration projects. Each action should be co-ordinated with the actions supported under the Biofuels Cities initiative, and set its messages in the context of the relevant EU policy and legislation, for example the Directives on Biofuels (2003).

6.1.3.2. Research activities having an impact in the medium and longer term

In accordance with the principle of focussing research effort, the following sections 6.1.3.2.1 to 6.1.3.2.5 first describe the main objectives to be achieved and the strategically important areas in which research should be concentrated. They then go on to provide details of the technical content of the third call (Call 2005.ML) and the fourth call (Call 2006.ML).

Where appropriate, quantified targets are set out in the Work Programme. They are ambitious long-term targets (15-20 years) and not easy to achieve. Nevertheless, they are a clear indication of the scale of achievements to which an individual proposal should aspire.

6.1.3.2.1. Fuel cells, including their applications

[Activity Code : SUSTDEV-1.2.1]

Research is needed to reduce the cost and improve the performance and durability of fuel cell systems for stationary, transport, and portable applications, to enable them to compete with conventional combustion technologies. This will include the optimisation and simplification of fuel cell subsystems and components as well as testing and characterisation protocols. *The long-term target is to achieve an attractive return on investment by 2020 for many applications.*

For fuel cells, the strategically important areas in which research should be concentrated are : **the development of competitive fuel cell and related technologies for stationary and transport applications** (*covering both low temperature fuel cell systems, including stacks, fuel processors, etc. and related technologies such as reversible fuel-cell/ electrolysers and high temperature fuel cell systems. The emphasis for RTD will be on materials, processes and component level development, aimed at improving performance and durability, whilst also reducing costs.*) and **fuel cell systems applications** (*research will concentrate on systems and integration for various applications, exploiting, where appropriate, synergies between applications, e.g. technologies for multi-fuel capability. Research will include system simplification, simulation and modelling, optimisation and cost reduction of auxiliary components and balance of plant. The types of application concerned are : small and medium size, mainly low temperature, fuel cells, power generation in the range of 0.5 - 5 MW, development of portable power systems and Auxiliary Power Units, fuel cell systems for small road vehicles and fuel cell systems for heavy duty road, marine and railway transportation.*).

Research areas and topics for 2005

Work Programme to be updated in Summer 2004.

See also Joint Calls in Chapter 6.1.4.

Research areas and topics for 2006

Work Programme to be updated in Summer 2004.

6.1.3.2.2. New technologies for energy carriers/transport and storage, in particular hydrogen

[Activity Codes : SUSTDEV-1.2.2 (hydrogen); SUSTDEV-1.2.3 (electricity)]

Hydrogen and electricity have the potential to become the principal, interlinked energy carriers in a future sustainable energy economy. Together they can provide a unique pathway for gradually becoming progressively less dependent on fossil fuels, reducing greenhouse gas and pollutant emissions and increasing the contribution of renewable energy sources.

In the long term, hydrogen will play a key role in adapting energy supply to energy demand as hydrogen has the potential for large-scale, even seasonal, energy storage. The transition towards future sustainable energy networks based on a large share of renewable and distributed generation requires the preparation of the European energy system for the large-scale integration of Distributed Energy Resources (DER). This concept will play a key role in transforming the conventional electricity transmission and distribution grid into an *unified and interactive energy service network* using common European planning and operation methods and systems.

For hydrogen, the strategically important areas in which research should be concentrated are : **clean production** (*development, analysis and comparative assessment of cost-effective pathways for hydrogen production from existing and novel processes*), **storage** (*exploration of a wide range of large and small scale systems*), **basic materials** (*electrochemical materials for electrolysers and fuel processors, materials for hydrogen storage and hydrogen separation and purification*), **safety** (*over the complete fuel chain, including pre-normative RTD aimed at identifying safety critical events and the preparation of regulations and safety standards at EU and global level*), **distribution** (*development, validation and analysis of alternative technology options for hydrogen distribution networks and fuelling infrastructure both for large scale and local hydrogen economies*) and **preparing the transition to a hydrogen energy economy** (*identification and assessment of barriers, pathways and options and development of strategies leading to the implementation of a hydrogen economy*).

For electricity, the strategically important areas in which research should be concentrated are : **a new approach for large-scale implementation of Distributed Energy Resources (DER) in Europe** (*design, development and validation of novel components and DER solutions needed for future interactive energy service networks*), **energy storage technologies and systems for grid-connected applications** (*innovative energy storage concepts to facilitate the large-scale penetration of DER*) and **the development of key enabling technologies** (*for distributed energy networks with high power quality and security of service, including development of low-loss cables for transmission systems and high temperature superconductor based components for electrical applications, such as fault current limiters, motors, transformers etc*).

Research areas and topics for 2005

Work Programme to be updated in Summer 2004.

See also Joint Calls in Chapter 6.1.4.

Research areas and topics for 2006

Work Programme to be updated in Summer 2004.

6.1.3.2.3. New and advanced concepts in renewable energy technologies

[Activity Codes : SUSTDEV-1.2.4 (PV); SUSTDEV-1.2.5 (biomass); SUSTDEV-1.2.6 (Other RES)]

Renewable energy technologies have, in the long term, the potential to make a large contribution to the EU and world energy supply. The main targets are to decrease the cost of electricity and fuel to competitive levels through developing highly efficient concepts and bringing about major cost reductions in the entire production chain, as well as improving the reliability, safety, availability and durability of renewable energy systems.

For **photovoltaics**, the strategically important areas in which research should be concentrated are : **innovative concepts and fundamental materials research for the next generation of PV technologies** (*e.g. organic or hybrid solar cells*), **thin film PV technology** (*development of cost-effective PV cells and modules based on new and improved technologies and materials*), **PV processing and automated manufacturing technologies** (*to reduce the costs and improve materials usage in the manufacture of PV cells and modules*), **PV components and systems – balance of systems** (*research into components and their integration into the overall system*) and **the research for innovative applications of PV in buildings and the built environment** (*to develop integrated PV module systems which are configured for ease of mounting on building roofs and facades, hybrid PV/heating systems*). The main targets are to: decrease the investment cost for PV systems to 1-2 €/Wp (with a module cost of 0.5-1 €/Wp) by 2015 and to decrease PV electricity cost to below 0.1 €/kWh by 2015.

For **biomass**, the strategically important areas in which research should be concentrated are : RTD for **reliable, efficient and cost-effective combustion technologies** (*with significant reduction of atmospheric pollutants, operation of large scale systems with multifuel resources including co-firing, self-running processes for small scale systems using standardised feed-stock)*), **reliable and cost-effective gasification systems** (*aimed at the efficient production of electricity and clean hydrogen-rich gas*), and **new methods for cost effective production of clean biofuels to be used in combustion engines and fuel cells** (*primarily from ligno-cellulosic feedstock*) and **energy from bio-residues and energy crops** (*innovative, low emission waste-to-energy and crop-to-energy concepts and technology development*). The main targets are: to decrease the cost of electricity production with biomass to 0.05 €/kWh by 2015-2020 and to decrease the cost of biofuels to 10 €/GJ (0.036 €/kWh) by 2020.

For **other renewable energy sources** having the potential to contribute significantly to the EU energy supply in the medium-to-long term, the strategically important areas in which research should be concentrated are : **wind** (*research and integration of efforts needed to solve the challenges of on- and off-shore systems by developing innovative new materials, enhanced aerodynamics, and novel designs for structures and foundations, along with associated pre-normative research. Methods and techniques that reduce the uncertainty of costs and production, on the basis of more accurate and cheaper measurement and modelling of site climate conditions - both for resource assessment and design*), **geothermal** (*to verify the technical feasibility and cost-effectiveness of electricity production from enhanced geothermal systems, through innovative research into exploration, resource assessment and management techniques, cheaper and more advanced drilling and stimulation technologies, and more efficient power cycles*), **ocean** (*new concepts to improve the availability and predictability of deliverable energy, coupled with better installation and production methods, and harmonised testing methods to support the development of cheaper and safer on- and offshore systems*), and **concentrated solar thermal** (*for electricity and heat generation: new concepts for low-cost, efficient and reliable components and systems; for non-electrical processes: high temperature chemical solar reactors for the production of hydrogen and other high-value*

materials). The main target is to decrease the cost of electricity production with these RES to 0.05 €/kWh by 2020.

Research areas and topics for 2005

Work Programme to be updated in Summer 2004.

Research areas and topics for 2006

Work Programme to be updated in Summer 2004.

6.1.3.2.4. Capture and sequestration of CO_2, associated with cleaner fossil fuel plants

[Activity Code : SUSTDEV-1.2.7]

Global and EU energy supply will, for the foreseeable future (2015 - 2020), be dominated by fossil energy sources. However, their CO_2 emissions are a major drawback in the context of global climate change. The challenge is therefore to be able to use these fossil fuels whilst eliminating CO_2 through cost-effective capture and sequestration and at the same time maintaining EU industrial competitiveness in global markets. *Targets: reduce the cost of CO_2 capture from 50-60 € to 20-30 € per tonne of CO_2 captured, whilst aiming at achieving capture rates above 90%, and assess the reliability and long term stability of sequestration.*

For capture and sequestration of CO_2, the strategically important areas in which research should be concentrated are : **post-combustion CO_2 capture** (*RTD on new and retrofit options for post-combustion capture of CO_2 and suitability for subsequent sequestration options.*), **pre-combustion CO_2 capture** (*RTD on pre-combustion CO_2 capture options such as de-carbonisation and oxy-fuel techniques. RTD on suitability of captured gases for subsequent sequestration options will form part of this research.*), **geological sequestration of CO_2** (*RTD aiming at safe, reliable and stable cost-effective sequestration options such as saline aquifers, enhanced coal bed methane and enhanced oil recovery. Sequestration potential, long term geological stability and geochemical interactions, public acceptance and cost are key issues.*), and **chemical/ mineral sequestration of CO_2** (*Comparison of the available options, as well as other innovative solutions and uses of the products. Public acceptance, sequestration potential, transport and mining activities, environmental impact, applied chemistry and kinetics are key issues.*).

Research areas and topics for 2005

Work Programme to be updated in Summer 2004.

Research areas and topics for 2006

Work Programme to be updated in Summer 2004.

6.1.3.2.5. Socio-economic tools and concepts for energy strategy

[Activity Code : SUSTDEV-1.2.8]

Socio-economic research related to energy RTD will be systematically integrated into research carried out in the technological areas described in the preceding sections. Nevertheless, common and harmonised tools should be developed to tackle the complex social and economic issues of new energy technologies. Competition with conventional energy technologies in a medium to long term perspective, questions of socio-environmental damages of energy production and consumption, of the implementation of new and emerging energy technologies into society and of shaping the future sustainable energy system should be covered. Foresight exercises should be carried out to build up strategies for energy governance as well as to define alternative ways to achieve societal objectives.

For socio-economic tools and concepts, the strategically important areas in which research should be concentrated are[9] : **energy external costs** (*methodological development to better quantify the social and environmental damages of energy production and consumption in the EU, in the Accession States and in the Mediterranean area*), **social issues related to implementation of medium and long term energy technologies** (*including economic aspects, consumer preferences/ behaviour, social acceptance and influence of private sector choices. The socio-economic impacts of sustainable policies and measures should also be covered for the EU and in the world perspective, including developing countries*), **quantitative and qualitative forecasting methods** (*Energy-Economy-Environment forecasts for the long-term (2020-2030) and very long-term (2050-2100) should deal with resource depletion, climate change and radioactive waste management and other issues at the EU and world-level. Integration of energy, economy and environment aspects, comparison of various models and alternative scenarios will enable the assessment of the evolution of sustainable development*) and **ethics in energy** (*the aim should be to analyse the implications and produce guidelines for ethical governance taking into account all energy policy issues and covering the entire energy chain*).

Research areas and topics for 2005

Work Programme to be updated in Summer 2004.

Research areas and topics for 2006

Work Programme to be updated in Summer 2004.

[9] Research under this area will complement and take into account the research to be carried out under Chapter 8.1 “Policy-orientated research”.

6.1.4.Links to Other Research Topics and Technical Content of Joint Calls

6.1.4.1. Links to other research topics - general

Activities will be integrated and co-ordinated, as necessary, within and between actions and activities in this and other priorities, including the activities of the Joint Research Centre and national programmes.

Co-ordination within this priority thematic area (No. 6)

The potential for future collaboration will be closely monitored in the following areas :

- Priority 6.2 : Sustainable surface transport;
- Priority 6.3 : Global change and eco-systems.

Proposals that address more than one thematic area will be accommodated by the Commission, provided the proposal addresses areas covered by this work programme. The general principle for the submission of proposals is:

- Proposals must clearly address the objectives and priorities set out in the relevant work programme sections and should be submitted to the priority area to which they are most closely linked. For example, generic RTD on fuel cells (stacks, catalysis, components, systems, …) is tackled in the medium to long term priorities of sustainable energy systems; research for the integration of stacks, components and systems into transport vehicles should be dealt with by sustainable surface transport.

Co-ordination with other priority areas for research

The potential for future collaboration will be closely monitored in the following areas :

- Priority 2 : Information Society technologies;
- Priority 3 : Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices;
- Supporting policies and anticipating scientific and technological needs;
- Support for the co-ordination of national activities.

Proposals that address more than one thematic area will be accommodated by the Commission, provided the proposal addresses areas covered by this work programme. The general principle for the submission of proposals is:

- Proposals which intend to develop a new technology (e.g. information and communication, biotechnology, nanotechnology, …) should seek funding from the priority area most directly linked with such a technology; proposals aimed at the use or integration of a given technology in RTD activities to pursue the objectives of "Sustainable "Energy Systems" should be addressed to this priority.

In addition, it should be noted that energy related RTD may also be carried out in the context of the Specific Programme "Structuring the European Research Area", for example in the areas of "*horizontal research activities involving SMEs*", "*specific measures in support of international co-operation*", "*human resources and mobility*", "*research infrastructures*", and "*science and society*".

6.1.4.2. Technical Content of Joint Calls in the field of hydrogen and fuel cells

6.1.4.2.1. Rationale

Hydrogen and fuel cell technologies are recognised as core long term technologies for realising global sustainable energy. Hydrogen complements electricity and together they represent the most promising mass market energy vectors for delivering sustainable energy for stationary heat and power and transport in the long term. However hydrogen and fuel cell energy systems represent a radical paradigm shift in the way Europe produces and uses energy. To bring hydrogen and fuel cells to the point of commercial readiness and viability in terms of performance and cost, substantial effort on research, technological development and validation is still needed.

The availability of new materials with improved performance and at competitive cost will be a key factor to commercialisation. In particular, nanotechnology can open new solutions for innovative products and processes.

Deepening co-operation through co-ordinated and joint calls will deliver benefits in terms of building critical mass, better coverage of the domain, cross-fertilisation of ideas between an extended range of disciplines and stakeholders, and ensure that cross-cutting evaluations deliver the best strategic combination of complementary projects.

Where appropriate, Integrated Projects should address societal, health, environmental, ethical and regulatory issues. In particular, validation and benchmarking, as well as education and training aspects should be included. Strategies for management of risk should be included in IPs, where relevant. All IPs should have strong industrial participation.

A well co-ordinated, strategically selected set of FP6 projects will provide a concerted and essential technical input to the European Hydrogen and Fuel Cell Technology Platform, as well as to the transport related technology platforms ERTRAC, ERRAC and ACARE and the Alternative Motor Fuels policy initiative. It will also help establish the definition and detailed planning phase of a substantial and broad ranging hydrogen communities technology initiative designed to stimulate growth and accelerate the move towards the hydrogen economy, under the Growth initiative[10]

The results of the activities to be funded under these joint and other coordinated calls on the field of H2 and fuel cells will form the basis for delivering the technologies which should be tested, validated and demonstrated in the hydrogen economy projects identified as Quick-Start in the Growth initiative.

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[10] Following the Growth Initiative (*****), the European Council of 12 December 2003 invited the European Commission to implement public private partnerships and to orient projects and funds in the field of hydrogen towards the priorities identified in the Quick Start Programme, namely hydrogen production and use in communities.

(*****) COM(2003)690: Commission Communication on a European initiative for Growth investing in networks and knowledge for growth and jobs. It includes the so-called "Quick Start Programme"

6.1.4.2.2. Joint Call on component development and systems integration of hydrogen and fuel cells for transport and other applications

(Joint Call between Thematic Priorities 4, 6.1.ii and 6.2)

Rationale:
The aim is to develop the core technologies for hydrogen and fuel cell systems for transport applications – many of which may also be applicable to stationary applications. The cost/ performance/ reliability/ packaging targets for transport applications are amongst the most demanding for hydrogen and fuel cells. Safety, reliability, weight, performance and packaging are nowhere more demanding than in aeronautics. Nevertheless, synergetic development of components and systems can lead to a progressive market evolution, starting with premium price, niche market applications in aircraft, trains, ships, stationary Combined Heat and Power (CHP) and leading to trucks, buses and eventually to the automotive mass market. The main aim is to develop generic technology and modular systems - built up from components that can be manufactured in essentially similar configurations, but with different qualities, to meet the specific performance, lifetime and cost requirements of the different applications (e.g. FC stacks, Membrane Electrode Assemblies (MEAs), batteries, power electronics). Essential components include stacks and major sub-systems such as fuel processors, Auxiliary Power Units (APUs), and individual components.

There is a need to develop a comprehensive approach to systems integration. Tools are required for integrating complete hydrogen /fuel cell energy systems, comprising the fuel processor (if applicable), stack and Balance of Plant (BoP). The aim is optimised overall system efficiency by better transient control and integrated heat and water management - adapted to small and large scale stationary and transport applications (automotive, bus, truck, ship and rail auxiliary power units). Overall system safety shall be addressed.

6.1.4.2.2.1. Fuel Cell and Hybrid Vehicle Development

[Activity Code : SUSTDEV-AERO-2004-Hydrogen-1.1]

The development of electric drivetrains and components for hydrogen Internal Combustion Engines (ICE)/ electric hybrid vehicles is essential for opening the pathway to commercialisation of fuel cell vehicles. Hybrid drivetrains will deliver economies of scale for components and electronic control systems. Efficient, low cost, mass market electrical and electronic drive-train components should be developed in a modular and scalable way, and proved in the near term in hybrid fuel cell platforms - whilst at the same time pursuing the possibility of coupling them with innovative, hydrogen-fuelled energy converters in similar hybrid configurations. This will underpin the development of a strong EU-based industry for fuel cell electric drivetrain components and energy storage devices (batteries, supercapacitors).

Objective:
The overall target is to validate a hybrid vehicle with “well to wheel” energy efficiency exceeding 35% on the extended urban European drive cycle, and “tank to wheel” CO_2 emissions not exceeding 80g/km CO_2, when fuelled by hydrogen derived from fossil based fuels, and near zero CO2 and pollutant emissions if fuelled by hydrogen produced from renewable sources.

RTD Activity:

System level RTD: The latest component technologies should be integrated in vehicle platforms to enable validation of key operating parameters. The platforms should consolidate previous RTD effort on advanced batteries, supercapacitors, electric motors, control systems, advanced combustion engines, fuel cell stacks, etc, to arrive at systems optimised for energy efficiency over the European drive cycle. Where appropriate, and innovation is not compromised, system integration should contribute to developing standardised "open system" interfaces and modules for electrical and mechanical systems and communications protocols in order to create more open markets for the component suppliers, covering where possible, both parallel and serial hybrid configurations.

Fuel cell system components: Generic development of low-cost, mass market components for fuel cell auxiliary equipment, including air compressors, fans, humidification and water management systems, hydrogen consumption measurement, H2 safety sensors, hydrogen control valves, compact, high heat transfer heat exchangers; proposals should be complementary to recent projects, such as HyTRAN, and the FUERO cluster project.

Electric drivetrain components: Development of energy storage devices for hybrid drive-train components including super-capacitors, high power batteries (with sufficient power and energy to cover duration of FC system cold-start), efficient, high energy density traction (including lightweight hub) motors; low cost, more efficient power electronic devices, including converters, inverters, and electronic control systems, and including drive-by-wire and control strategies designed to optimise energy conversions and component life. This effort should build on the STREPs on hybrid systems funded in the second call, as well as previous and running projects in this area (e.g. SUVA, EST, ELMAS, INMOVE, OPTELEC, S-CAP, SCOPE, CAMELIA, PROBATT, etc.)

Component and system safety will be a high priority to be addressed in co-operation with the Network of Excellence HySafe which will develop a prioritised action plan for analysing and testing hydrogen handling and hydrogen system safety.

The main deliverables will be a fully integrated platform and sub-systems designed to prove the most promising hybrid FC vehicle concept with potential hybrid hydrogen ICE platform applications taken into consideration. Validation shall include component and system performance and lifetime testing and cost assessment, with forecasts for future development potential, based on the latest component developments and full scale testing on the bench and / or prototypes if necessary.

Instruments:

One IP, combining component development with delivery of at least one optimised hybrid platform for testing:

Fuel cell stack development is not the subject of this joint call and will be covered separately under Sustainable Energy .

Scope for two STREPs focussing on specific component technology bottlenecks.

Component development is an opportunity to involve innovative SMEs.

Where applicable, the aim should be to develop modular components adaptable to requirements of applications in domestic power generation, road vehicles, shipborne, trainborne or aircraft or aerospace equipment.

Dual use applications may also be considered.

Consortia should demonstrate a coherent exploitation strategy linking hybrid hydrogen ICE/electric development with fuel cell development and leading to early market entry of hybrid powertrains.

6.1.4.2.2.2. Integration of Fuel Cell systems and fuel processors for aeronautics, waterborne and other transport applications

[Activity Code : SUSTDEV-AERO-2004-Hydrogen-1.2]

Airborne, water-borne, rail, and stationary CHP or Uninterruptible Power Supply (UPS) systems represent premium power applications for fuel cells. A significant market is predicted for stationary CHP, ship propulsion and ship/aircraft auxiliary power units in the power range 100-500kW. Safety, reliability and durability are paramount considerations and, for aeronautics especially, packaging and weight constraints are also extremely stringent. For aeronautics there is interest to develop and prove concepts for Auxiliary Power Units i)fuelled by reforming on-board kerosene, and ii)fuelled by liquid hydrogen. Vessels for inland waterways and autonomous urban light rail also represent applications where hydrogen fuel cells can bring substantial environmental benefits, through reduced water and air pollution. Ship-borne fuel cell systems may be developed for main propulsion or to provide auxiliary power for "hotel" loads and deck equipment. Fishing vessels, short-sea ferries are also potential applications for hydrogen-fuelled, fuel cell propulsion in environmentally sensitive areas (e.g. inland or coastal waterways). Two main lines of research are envisaged, and may be pursued in parallel, or in an integrated way : -

- Generic RTD on fuel processors for on-board hydrogen production from hydro-carbon fuels for ships, aircraft, and trucks.
- Generic RTD on components and systems development and integration for fuel cell systems for compact domestic CHP, and for auxiliary power units (APUs) in the power range100kW to 500kW, for aircraft, ships.

Objectives:
The aim here is for a generic, preferably modular approach, developing integrated systems and components that can be adapted or re-configured to meet the different applications requirements. Fuel processors should achieve at least 85% efficiency (H2 LHV), and less than 10ppm CO, S.

Integrated hydrogen fuel cell systems for aircraft will aim at power densities at system level exceeding 0.5 kW/kg and 0.5 kW/l. Stationary CHP and ships systems will aim at 0.2 kW/kg and 0.25 kW/l excluding any fuel processor. Fuel cell system efficiency for CHP should exceed 80% when operating in combined mode.

Joint RTD activities:
Generic RTD on fuel processors for middle distillate hydrocarbon fuels used in ships and aircraft: The focus is on middle distillates – especially kerosene and diesel for aircraft, ship and truck applications, addressing requirements specification, system integration, design development and realisation of fuel processor systems for aircraft, ship and truck applications. RTD emphasis is on generic reforming technologies *for middle distillate fuels (diesel, kerosene),* including de-sulphurisation, CO removal and reformate gas clean up; investigation of different reformer/clean-up configurations (e.g. micro-reactor, hybrid) aimed at optimising system efficiency and packaging, through better system integration, and adapted to fuel cell requirements. Scope of work is likely to include: development of lower cost, more active reformer catalysts; sealing; lightweight, corrosion resistant reactor materials amenable to low cost fabrication; development and application of modelling tools to optimise system integration, simulate two-phase fluid flows, chemical kinetics and heat transfer.

RTD on integrated hydrogen fuel cell systems: Development of integrated, modular fuel cell systems and Balance of Plant in the power range 100-500kW, adaptable to aeronautics

APUs, marine, and stationary applications – aiming at optimising overall efficiency, taking into account the balance of electricity and heat for ship and aircraft "hotel" loads, aircraft control systems, ship propulsion, cargo handling and/or cargo-conditioning equipment. For ships, effort should also be directed at the use of hydrogen as a fuel for marine fuel cell applications, including aspects relating to refuelling.

For ships and domestic CHP *only*, a comprehensive pre-normative analysis of hydrogen and fuel cell *system safety* should be carried out, including hazard and risk analysis. For ships, this may extend to fuel handling, refuelling, and storage on board. The impact on overall ship design of introducing hydrogen and fuel cell systems should be carefully analysed with a view to developing integrated ship systems, optimised for energy consumption, operating costs and pollution abatement. Strategies, procedures and equipment should be developed for dealing with emergencies at sea, such as loss of propulsion, storm, fire, accident. For aircraft the system will include development and integration of a LH2 storage tank, filling and tank safety systems and sensors. System interfaces will be covered by other research activities.

Instruments: Indicatively two IPs as follows:

IP 1: Generic fuel processor: combining basic research, system integration and prototype demonstration (e.g. 10-50 kW) for proof of concept of a fuel processor for high sulphur diesel, marine diesel, and kerosene. Partnership should include competent manufacturers, research undertakings, reformer fabricators and catalyst suppliers, and representative organisations from end user applications, such as aircraft, ship, truck. Dual use applications may also be considered.

IP 2: Integrated fuel cell systems: integrated fuel cell system platforms in which the stack, and stack-related, balance of plant are adaptable to aircraft, ship and stationary CHP applications demonstrating proof of concept. The developed fuel cell systems should address all the issues for power modules approximately in the range 100-500kW, including validation within the overall operating environment (for example vehicle system architecture). For ship systems this includes proof of concept under sea-going conditions. Smaller systems may be appropriate as pilot research systems, provided they are representative of full-scale systems. The core of the IP will be the fuel cell system, developed as far as possible in a generic way, and then customised in up to three possible platform configurations.

Platform 1: fuel cell power unit, supplying stationary CHP, and CHP for ship hotel and cargo conditioning loads; this may include the development of a fuel processor for marine diesel, if not covered in a proposal for IP 1.

Platform 2: an autonomous hydrogen fuelled fuel cell system for ship, and stationary CHP, supplying propulsion /hotel CHP, and cargo conditioning loads. Consortia should endeavour to include innovative SMEs for component development.

Platform 3: Fuel cell APU, based on kerosene reformer technology or direct hydrogen

Proposals concerning waterborne hydrogen and fuel cell systems should complement and build on the work being carried out in the feasibility study FCSHIP and the specific support action New-H-Ship, as well as any waterborne fuel cell related projects that may be supported under the second call.

Aeronautics related activities should complement the ongoing and previously funded activities such as the Technology Platform POA and the CRYOPLANE project.

Proposals on fuel processing should be complementary to recent projects, such as DIRECT, Bio-FEAT, HyTRAN.

Dual use applications may also be considered.

6.1.4.2.3. Joint Call for the support of the co-ordination, assessment and monitoring of research to contribute to the definition phase for a hydrogen communities initiative

(Joint Call between Thematic Priorities 4, 6.1.ii and 6.2)

[Activity Code : SUSTDEV-AERO-2004-Hydrogen-2]

Rationale:
The European Initiative for Growth is aimed at stimulating economic growth through a number of key projects promoting transport and energy networks, and development of core technologies that are considered key to future economic growth. The Quick-start Programme of the Initiative for Growth, includes a project on the hydrogen economy, which has a component aimed at the development of fully integrated, largely autonomous hydrogen communities, combining hydrogen fuel cell systems for stationary CHP, and transport, and exploiting where possible synergies between applications (Hycom). The hydrogen communities initiative is of 10 years estimated duration and an indicative budget of 1.5 b€, with the clear goal of providing sufficient pump-priming actions to stimulate the start up and growth of hydrogen industries and markets in Europe. The initiative should provide sufficient critical mass for a substantial joint procurement programme for validation of prototypes based on the most promising technologies in a range of applications, under different operating conditions (climatic, duty cycle, primary energy source, etc). Three phases are envisaged – definition, planning and co-ordination, detail design and implementation, and test and validation. The scoping and planning phase for the hydrogen communities initiative, as well as possibly the following implementation and validations phases, will be carried out in close co-ordination with the hydrogen production component (Hypogen) of the hydrogen economy Quick-start project.

The challenges associated to technologies for these hydrogen communities will require large scale research and demonstration activities in the coming years. Such activities would require a paramount investment. It is of utmost importance to coordinate, monitor and assess permanently all the efforts done in research and demonstration. Research will deliver new knowledge and technologies, and demonstration will test and validate these technologies in real life environments, i.e. hydrogen communities. Despite the different nature of research and demonstration activities (e.g. different type of risks, different actors, different users of results, different instruments) their implementation requires a close coordination and interaction, from the planning to the execution stage.

Objective:
To co-ordinate, assess and monitor research to contribute to the definition, planning and co-ordination phase for a 10 years large scale hydrogen communities initiative, designed to test and validate the potential for hydrogen as universal sustainable energy vector for communities, jointly with electricity. The scale of the envisaged initiative, is such that a comprehensive co-ordination, assessment and monitoring of research for the planning and definition phase addressing technological options together with socio-economic, operational and safety aspects is necessary to proceed with the following stages of this initiative.

Co-ordination of projects that are pursuing similar or complementary objectives will help to optimise efforts. Constant monitoring and assessment will stimulate the activities and will accelerate the learning process allowing measuring progress towards intermediate milestones and final targets.

In addition a constant technology watch would be necessary to guarantee a quick uptake by the market, or by demonstration initiatives, of the emerging results from research and development activities. In addition, the monitoring and assessment of the demonstrations, foreseen in a complementary action, will provide feedback and guidance for the definition and planning of research.

RTD Activity:
Research monitoring and assessment, together with permanent technology watch, to identify technological solutions under development that could provide potentially economically and sustainable viable hydrogen sources and energy conversion options (e.g. conventional combustion and fuel cells), addressing climatic, economic and social diversity in Europe, as well as synergies between applications and technologies.

The planning phase will require stocktaking of different technologies under development and assessment of their potential for implementation and the needs for further development. It will seek to ensure the alignment of on-going research work with the hydrogen communities initiative goals and recommendation of best options towards achieving sufficient maturity to undertake pilot and large-scale validation.

Studies should assess the potential use in communities of renewable hydrogen (e.g. from wind, ocean, solar, biomass) or hydrogen from de-carbonised fossil energy sources, or possibly by-product hydrogen in remote autonomous communities “hydrogen villages”, “hydrogen islands”, or a “hydrogen community within a community” (e.g. hydrogen industrial park, campus or an airport).

The work will include the assessment of potential RTD stakeholders and their possible ways of involvement (e.g. financial, technological, development, equipment/infrastructure supply, legal structures, financial aspects, etc) in the different phases.

The studies are likely to address further development of specific renewable energy converters, optimised throughout the power conversion chain, to the specific requirements of production of sufficiently pure hydrogen for fuel cell applications. The planning phase should also require input from socio-economic research to establish the cost effectiveness, social and environmental implications of the range of hydrogen paths evaluated, as well as scoping the further analysis needed to assess impacts in the following phases.

The project will monitor and assess input form relevant on-going and future research activities funded under FP6 (e.g. HyWAYS, NATURALHY, HyTRAN, HySAFE, STOREHY, etc).

This call will be carried out in close co-ordination with the short to medium term part of the Sustainable Energy Systems Work Programme that aims at supporting “seed” demonstration projects for future hydrogen communities and establishing the Partnership “Hydrogen for Transport” that will include a similar assessment and monitoring framework for demonstration activities. This Partnership will deliver best practices in terms of stakeholder involvement and co-ordination, as well as proposals for possible management structures for the implementation and demonstration aspects of hydrogen communities.

Instruments:
One IP conducting a set of comprehensive co-ordination, monitoring, assessment and planning actions and studies, which should involve major stakeholders including research suppliers as well as developers and users of technologies.

A Co-ordination Action is envisaged in the short and medium term part of the Sustainable Energy Systems Work Programme (see chapter 6.1.3.1.4), aimed at the co-ordination and

assessment of demonstration activities. The two projects will be implemented in close association.

6.1.4.2.4. Proposed Co-ordinated Calls on materials development and processes for fuel cells and sustainable hydrogen production and storage technologies

(Proposed Co-ordinated Calls between Thematic Priorities 3 and 6.1.ii)

6.1.4.2.4.1. Basic materials and industrial process research on functional materials for fuel cells

6.1.4.2.4.2. Large scale innovative hydrogen production from non-fossil sources

6.1.4.2.4.3. Improved, energy efficient hydrogen storage systems especially for transport

***Note** : the content of these calls is only indicative at this stage. Final details, including instruments and indicative budget allocations, will be provided in the next updates of this Work Programme (planned for July 2004) and the work programme for Priority 3 (NMT) (planned for September 2004).*

6.1.5.Implementation Plan and Related Issues

6.1.5.1. Indicative timetable and budget attribution (roadmap)

It is intended to implement the Programme through a series of Calls for Proposals, with fixed closing dates. Table 1 shows the indicative roadmap for the whole of the Sixth Framework Programme.

Specific details of the calls for proposals covering the first two years of the programme are provided in Sections 6.1.6 (Call information) and 6.1.3 (Technical content).

6.1.5.2. Evaluation criteria

The set of criteria applicable to this work programme, together with the corresponding evaluation thresholds, is given in Annex B. In addition, Annex B outlines how the following will be addressed: gender issues, ethical and/or safety aspects, and the education dimension.

Table 1 : Roadmap

The following table shows the indicative timetable and budget allocation for the whole of the duration of the Specific Programme. In addition, for each call, the technical areas open and the types of instrument* to be used are also shown. N.B. The Joint Calls are shown separately in Table 2.

Call Identifier :		**2003.SM**	**2003.ML**	**2004.SM**	**2004.ML**	**2005.SM**	**2005.ML**	**2006.SM**	**2006.ML**
Planned launch date :		17 December 2002		17 June 2003	10 Oct 2003	June 2004	Sept 2004	June 2005	Sept 2005
Planned closing date :		18 March 2003		17 December 2003		December 2004		December 2005	
Research activities having an impact in the short and medium term									
6.1.3.1.1.1	***Cost-effective supply***	IP, STRP, CA, SSA	-	-	-	IP, STRP, CA, SSA	-	IP, STRP, CA, SSA	-
6.1.3.1.1.2	***Large-scale integration***	CA, SSA	-	IP (CONCERTO), STRP, CA, SSA	-	-	-	IP, SSA	-
6.1.3.1.2.1	***Eco-buildings***	IP, STRP	-	IP only (CONCERTO)	-	-	-	IP, STREP, SSA	-
6.1.3.1.2.2	***Polygeneration***	-	-	IP only (CONCERTO)	-	IP, STRP, CA, SSA	-	IP, STREP, SSA	-
6.1.3.1.3	***Alternative motor fuels***	IP, STRP, CA, SSA	-	IP, SSA	-	IP, STRP, CA, SSA	-	SSA	-
Research activities having an impact in the medium and longer term									
6.1.3.2.1	***Fuel cells***	-	All instr.	-	CA, SSA	-	All instr.	-	SSA only
6.1.3.2.2	***Energy carriers***	-	All instr.	-	CA, SSA	-	All instr.	-	SSA only
6.1.3.2.3	***Renewables***	-	All instr.	-	CA, SSA	-	All instr.	-	SSA only
6.1.3.2.4	***CO_2 sequestration***	-	All instr.	-	CA, SSA	-	All instr.	-	SSA only
6.1.3.2.5	***Socio-economic tools***	-	All instr.	-	CA, SSA	-	All instr.	-	SSA only
Indicative % of the overall budget		10%	24.5%	13%	0.5%	16%		15%	
Indicative Budget		82 M€	198 M€	107 M€	up to 3 M€	132M€		123M€	
Tentative % for the New Instruments		65%	65%	65%	0%	65%		65%	

Notes: *Dates and budget figures are indicative. Applicants should verify the closing dates in the text of the relevant call, as published in the Official Journal.*

The proposals will be evaluated and selected according to the guidelines and procedures laid down in the Guidelines on Proposal Evaluation Procedures, using the single stage submission procedure.

Complementary calls could be launched if the proposals from above calls do not adequately cover the priority topics of the WP. These complementary calls could also include funds for topping up or expanding consortia in on-going activities.

* Integrated Projects (IP), Networks of Excellence (NoE), Specific Targeted Research Projects (STRP), Co-ordination Actions (CA) and Specific Support Actions (SSA).

Table 2 : Roadmap for joint calls in the area of hydrogen and fuel cells

Call Identifier :	**Joint Call (1)**	**Joint Call (2)**
Planned launch date :	8 June 2004	8 June 2004
Planned closing date :	8 December 2004	8 December 2004
Thematic priorities involved in the Joint Call	4, 6.1.ii and 6.2	4, 6.1.ii and 6.2
Instruments	IP, STRP	IP
Indicative Budget	35 M€	4.5 M€
Tentative % for the New Instruments	65%	100%
Notes: *Dates and budget figures are indicative. Applicants should verify the closing dates in the text of the relevant call, as published in the Official Journal.* *The proposals will be evaluated and selected according to the guidelines and procedures laid down in the Guidelines on Proposal Evaluation Procedures, using the single stage submission procedure.*		

***Note** : It is also proposed to have Co-ordinated Calls on materials development and processes for fuel cells and sustainable hydrogen production and storage technologies, in conjunction with Thematic Priority 3 (nanotechnologies). The content of these calls is only indicative at this stage. Final details, including instruments and indicative budget allocations, will be provided in the next updates of this Work Programme (planned for July 2004) and the work programme for Priority 3 (planned for September 2004).*

6.1.6. Call Information

The following sections describe the indicative content of the Calls for Proposals envisaged to cover the final two years of FP6. Note, however, that only the Call Information published in the Official Journal has legal effect.

6.1.6.1. Content of Call 2005.SM[11]

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activities**:
– Priority thematic area of research "Aeronautics and Space".
– ***Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable energy systems"***
– Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable surface transport"

3. **Call title**: Periodic call in the area of "Aeronautics and Space", ***"Sustainable energy systems"*** and "Sustainable surface transport".

4. **Call identifier**: FP6-2004-TREN-3

5. **Date of publication**[12]: 8 June 2004.

6. **Closure date(s)** [13]:
– **"Aeronautics and Space":**
– **"Sustainable energy systems": 8 December 2004 at 17.00 (Brussels local time).**
– "Sustainable surface transport":

7. **Total indicative budget**: 252 M €, broken down as follows
– "Aeronautics and Space": 64 M€
– ***"Sustainable energy systems": 132 Million €***
– "Sustainable surface transport": 56 M €

Instrument[14]	€ (millions)
IP	176
STREP and CA	76
SSA	

[11] Note that the call for the short-to-medium term part of "sustainable energy systems" will form part of a call including elements of "aeronautics and space" as well as "sustainable surface transport".

[12] The director-general responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[13] When the envisaged publication date is either advanced or delayed, closure date(s) will be adjusted accordingly, if needed, in the published call for proposals.

[14] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

8. Areas called and Instruments:

– Aeronautics and Space

Area	Topic	Instrument

– ***Sustainable energy systems***

Area	Topic	Instrument
Section 6.1.3.1.1.1 « Cost effective supply of renewable energies »	Innovative combinations of biomass with fossil fuels	IP
	Innovative demonstrations of improvements to energy recovery and renewable electricity production using waste materials and other commonly available biomass feedstocks	IP
	Innovative approaches to improving the yield of medium to large scale biogas plants	STREP
	Innovative combinations of biomass and wastes with fossil fuels	STREP
	Innovative wind farms, components and design tools	STREP
	Innovations in PV manufacturing plant at industrial scale	STREP
	Geothermal energy	STREP
	Ocean / marine energy technologies	STREP
	All	CA and SSA
Section 6.1.3.1.1.2 “Large scale integration of renewable energy sources and energy efficiency” and Section 6.1.3.1.2.2 “Polygeneration”	Grid issues - Distributed electricity generation	STREP, CA and SSA
	Grid issues - Management of electricity grids linked to large scale decentralised wind power generation	STREP, CA and SSA
Section 6.1.3.1.2.2 “Polygeneration”	Improvement of the competitiveness of polygeneration	IP and STREP
	Innovative integration of polygeneration	IP and STREP
Section 6.1.3.1.3 “Alternative motor fuels”	Biofuel-Cities.	IP, STREP, CA
	Hydrogen for transport	IP, CA
Section 6.1.3.1. “Thematic promotion and dissemination”	Renewable electricity technologies	SSA
	Renewable heating and cooling technologies	SSA
	Production and distribution of liquid and gaseous biofuels	SSA
	Eco-buildings	SSA
	Polygeneration	SSA

	Energy demand management and renewable energy supply in high performance communities	SSA
	Alternative motor fuels	SSA

– Sustainable surface transport

Area	Topic	Instrument

9. Minimum number of participants[15]:

Instrument	Minimum number of participants
IP, STREP and CA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC
SSA	legal entity from a MS or AS

10. Restriction on participation: None.

11. Consortia agreements:
- Participants in IP are required to conclude a consortium agreement.
- Participants in STREP, CA, and SSA resulting from this call are encouraged, and may be required, to conclude a consortium agreement.

12. Evaluation procedure:
- The evaluation shall follow a single stage procedure.
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. Indicative evaluation and contractual timetable:
- Evaluation results: estimated to be available within some 4 months after the closure date
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after the closure date.

15. Additional terms:
- It is expected that this call should not result in more than 50 to 60 projects

[15] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.

Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

6.1.6.2. Indicative content of Call 2006.SM[16]

The text below will be revised, and will include the Call for (a) of Priority 6.2 Sustainable Surface Transport

1. **Specific Programme**: Integrating and strengthening the European Research Area

2. **Activities**:
- Priority thematic area of research "Aeronautics and Space".
- ***Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable energy systems"***
- Priority thematic area of research "Sustainable development, global change and ecosystems". Sub-priority "Sustainable surface transport"

3. **Call title**: Periodic call in the area of "Aeronautics and Space", "Sustainable energy systems" and "Sustainable surface transport".

4. **Call identifier**: [17]

5. **Date of publication**[18]: June 2005.

6. **Closure date(s)**[19]**:** December 2005 at 17.00 (Brussels local time).

7. **Total indicative budget:** €, broken down as follows
- ***"Sustainable energy systems":123 M €***
- "Sustainable surface transport": €

Instrument[20]	€ (millions)
IP	
STREP or CA	
SSA	

[16] Note that the call for the short-to-medium term part of "sustainable energy systems" will form part of a call including elements of "aeronautics and space" as well as "sustainable surface transport".

[17] The call identifier shall be given in the published version of this call.

[18] The Director-General responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[19] When the envisaged date of publication is either advanced or delayed (see previous footnote), closure date(s) will be adjusted accordingly, if needed.

[20] IP = Integrated project; NOE = Network of excellence; STREP = Specific targeted research project; CA = Coordination action; SSA = Specific support action

8. Areas called and Instruments:

– ***Sustainable energy systems***

Area	Topic	Instrument
Section 6.1.3.1.1.1 « Cost effective supply of renewable energies »	Demonstrations of innovative designs of automated biomass heating systems	STREP
	Solar heating and cooling	STREP
	Geothermal energy	STREP
	Innovative wind farms, components and design tools	STREP
	Demonstrations of the next generation of PV technologies / products	STREP
	Ocean / marine energy technologies	STREP
	All	CA, SSA
Section 6.1.3.1.2.1 “Eco-buildings	Eco-buildings	STREP
Section 6.1.3.1.2.2 “Polygeneration”	Polygeneration	STREP
Section 6.1.3.1.1.2 “Large scale integration of renewable energy sources and energy efficiency”	CONCERTO II– Managing energy demand and renewable energy supply in high performance communities	IP
Section 6.1.3.1.2.1 “Eco-buildings”	CONCERTO II – Managing energy demand and renewable energy supply in high performance communities	IP
Section 6.1.3.1.2.2 “Polygeneration”	CONCERTO II – Managing energy demand and renewable energy supply in high performance communities	IP
Section 6.1.3.1. “Thematic promotion and dissemination”	Renewable electricity technologies	SSA
	Renewable heating and cooling technologies	SSA
	Production and distribution of liquid and gaseous biofuels	SSA
	Eco-buildings	SSA
	Polygeneration	SSA
	Energy demand management and renewable energy supply in high performance communities	SSA
	Alternative motor fuels	SSA

– Sustainable surface transport

Area	Topic	Instrument

9. Minimum number of participants[21]:

Instrument	Minimum number of participants
IP, STREP and CA	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC
SSA	One legal entity from a MS or AS.

10. Restriction on participation: None.

11. Consortia agreements:
- Participants in IP are required to conclude a consortium agreement.
- Participants in STREP, CA and SSA resulting from this call are encouraged, and may be required, to conclude a consortium agreement.

12. Evaluation procedure:
- The evaluation shall follow a single stage procedure
- Proposals will not be evaluated anonymously.

13. Evaluation criteria: See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument.

14. **Indicative evaluation and contractual timetable:**
- Evaluation results: estimated to be available within some 4 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force 8 months after the closure date.

15. Additional terms:

- It is expected that this call should not result in more than x to x projects.

[21] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.

Any legal entity established in a Member State or Associated State and which is made up of the requested number of participant may be the sole participant in an indirect action.

6.1.6.3. Content of Joint Call (1)

1) Specific programme: Integrating and strengthening the European Research Area

2) Activities: Priority thematic areas of research of:
"*Aeronautics and space*",
"*Sustainable development, global change and ecosystems, 1) Sustainable Energy Systems, ii) Research activities having an impact in the medium and longer term*" and
"*Sustainable development, global change and ecosystems, 2) Sustainable surface transport*".

3) Call title: Thematic call in the area of "*Component development and systems integration of hydrogen and fuel cells for transport and other applications*".

4) Call identifier: FP6-2004-Hydrogen-1

5) Date of publication[22]: 8 June 2004

6) Closure date[23]: 8 December 2004 at 17.00 (Brussels local time).

7) Total indicative budget: 35 Million €, broken down as follows:

Instrument[24]	**€ (millions)**
IP	35
STREP	

8) Areas called and instruments:

Area	**Instrument**
Fuel Cell and Hybrid Vehicle Development. See Section 6.1.4.2.2.1 of the "Sustainable Energy Systems" Work Programme, Section 4.1.1 of the "Sustainable Surface Transport" Work Programme or Section 1.4.2.1 of the "Aeronautics and Space" Work Programme. *[Activity Code : SUSTDEV-AERO-2004-Hydrogen-1.1]*	IP, STREP
Integration of fuel cell systems and fuel processors for aeronautics, waterborne and other transport applications.	IP

[22] The director-general responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[23] When the envisaged publication date is either advanced or delayed, closure date(s) will be adjusted accordingly, if needed, in the published call for proposals.

[24] IP = Integrated project; STREP = Specific targeted research project

See Section 6.1.4.2.2.2 of the "Sustainable Energy Systems" Work Programme, Section 4.1.1 of the "Sustainable Surface Transport" Work Programme or Section 1.4.2.1 of the "Aeronautics and Space" Work Programme. *[Activity Code : SUSTDEV-AERO-2004-Hydrogen-1.2]*	

9) Minimum number of participants[25]:

Instrument	Minimum number of participants
IP and STREP	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.

10) Restrictions on participation: None.

11) Consortium agreements:

- Participants in IP are required to conclude a consortium agreement.
- Participants in STREP resulting from this call are encouraged, but not required, to conclude a consortium agreement.

12) Evaluation procedure:

- The evaluation shall follow a single stage procedure.
- Proposals will not be evaluated anonymously.

13) Evaluation criteria : See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument and their application.

14) Indicative evaluation and contractual timetable:

- Evaluation results: estimated to be available within some 4 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force before the end of 2005.

[25] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participants may be the sole participant in an indirect action.

6.1.6.4. Content of Joint Call (2)

1) Specific programme: Integrating and strengthening the European Research Area

2) Activities: Priority thematic areas of research of:
"*Aeronautics and space*",
"*Sustainable development, global change and ecosystems, 1) Sustainable Energy Systems, ii) Research activities having an impact in the medium and longer term*" and
"*Sustainable development, global change and ecosystems, 2) Sustainable surface transport*".

3) Call title: Thematic call in the area of "*Support of the co-ordination, assessment and monitoring of research to contribute to the definition phase for a hydrogen communities initiative*".

4) Call identifier: FP6-2004-Hydrogen-2

5) Date of publication[26]: 8 June 2004

6) Closure date[27]: 8 December 2004 at 17.00 (Brussels local time).

7) Total indicative budget: 4.5 Million €, broken down as follows:

Instrument[28]	**€ (millions)**
IP	4.5

8) Areas called and instruments:

Area	**Instrument**
Support of the co-ordination, assessment and monitoring of research to contribute to the definition phase for a hydrogen communities initiative. See Section 6.1.4.2.3 of the "Sustainable Energy Systems" Work Programme, Section 4.1.2 of the "Sustainable Surface Transport" Work Programme or Section 1.4.2.2 of the "Aeronautics and Space" Work Programme. *[Activity Code : SUSTDEV-AERO-2004-Hydrogen-2]*	IP

[26] The director-general responsible for the publication of this call may publish it up to one month prior or after its envisaged publication date.

[27] When the envisaged publication date is either advanced or delayed, closure date(s) will be adjusted accordingly, if needed, in the published call for proposals.

[28] IP = Integrated project

9) Minimum number of participants[29]:

Instrument	Minimum number of participants
IP	3 independent legal entities from 3 different MS or AS, with at least 2 MS or ACC.

10) Restrictions on participation: None.

11) Consortium agreements:

- Participants in IP are required to conclude a consortium agreement.

12) Evaluation procedure:

- The evaluation shall follow a single stage procedure.
- Proposals will not be evaluated anonymously.

13) Evaluation criteria : See Annex B of the work programme for the applicable criteria (including their individual weights and thresholds and the overall threshold) per instrument and their application.

14) Indicative evaluation and contractual timetable:

- Evaluation results: estimated to be available within some 4 months after the closure date;
- Conclusion of first contracts: it is estimated that the first contracts related to this call will come into force before the end of 2005.

[29] MS = Member States of the EU; AS (incl. ACC) = Associated States; ACC = Associated candidate countries.
Any legal entity established in a Member State or Associated State and which is made up of the requested number of participants may be the sole participant in an indirect action.