



THE SIXTH FRAMEWORK PROGRAMME

The Sixth Framework Programme covers Community activities in the field of research, technological development and demonstration (RTD) for the period 2002 to 2006

Integrating and Strengthening the European Research Area

**Priority 6.1.ii
Sustainable Energy Systems**

***Research activities having an impact in the medium
and longer term***

**REPORT ON THE ANALYSIS OF EoIs
relating to the
WORK PROGRAMME REVISION 2004**



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Introduction

Following the successful launch of the first calls for proposals for the Sixth Framework Programme Thematic Priority 6.1.ii, Sustainable Energy Systems, Research activities having an impact in the medium and longer term, the European Commission has initiated the process for the mid-term revision of the work programme that defines the technical content of the various research areas and the scope of future calls for proposals.

In this context, the European Commission invited the submission of Expressions of Interest (EoI) to participate in research actions for topics in the above thematic priority. The deadline for submission of EoIs, using the compulsory on-line submission form, as indicated in the guide for submitters was no later than 17.00 (Brussels local time) on 19 March 2004.

Submissions of EoIs were invited from those organisations or groups of organisations from the Member States, Associated Candidate Countries and other Associated States intending to form consortia (which may also have included entities from third countries and international organisations) to participate in research actions for topics that could be the subject of future calls for proposals. EoIs were particularly welcome for integrated projects and networks of excellence (the new instruments of FP6), as well as for specific targeted research projects and co-ordination actions.

The submission of EoIs was by no means obligatory and the Commission's treatment of them does not oblige it to formulate any call in a particular way. Only research actions considered ready for implementation and of the highest relevance are likely to be included in future calls. By this means, calls can be focused on top priority topics and so help to avoid the high level of over-subscription.

Along with advice received through wider consultations with stakeholders, the Advisory Group for Energy and the Programme Committee, the Commission will take account of the outcome of the EoI exercise when drawing up its proposals for revising the work programme and for topics to be included in future calls for proposals.

It must be emphasised that this exercise was neither a pre-assessment of the scientific and technological quality of any subsequent proposal nor a pre-selection process for any consortium. **Accordingly there will be no feedback on any individual EoI.**

In order to ensure transparency - and to encourage contacts across the research community - it is intended (*with the submitter's agreement*) that the EoIs will be made available in May 2004 on the CORDIS website, along with the EoI analysis report. This will be the principal feedback to those submitting EoIs and the research community as a whole.

Statistics on EoIs and Topics

A total of 451 Expressions of Interest were received, of which 32 were test sendings, duplicates, incomplete submissions, out of scope, and so on, leaving 419 EoIs to be analysed. A total of 106 submitters out of the 419 analysed asked for their EoIs to be kept confidential, so they will not be published in CORDIS. 73 submitters declared that their EoIs related to proposals submitted but not funded under the First Call for Medium to Long Sustainable Energy Systems Proposals. Detailed statistics on instrument types, submitting organisations, funding and geographical participation in the EoIs are given in Annexe A.

Content of the EoI Form

To help submitters prepare their EoIs, a guide for submitters, on-line submission form, help desk address and further information relevant to this invitation to submit EoIs were published in the Commission's CORDIS website.

Submitters were asked to provide the following information on the EoI Form:

- Potential impact and relevance to the sustainable energy systems (research activities having an impact in the medium and longer term) programme objectives
- Scientific and Technical Objectives
- Outline Implementation Plan
- Envisaged Consortium

Background and objectives of the analysis

The Commission analysed the EoIs with the assistance of experts, in order to identify a number of research topics which show high relevance to the Specific Programme and which may be used as a possible basis for the 2004 revision of the Work Programme and the Third Call for Proposals.

The focus was therefore on the research topics, not on the assessment of the individual EoI submissions, which will not receive any individual feedback. As such, the objective was to identify from individual or clusters of EoIs, research topics which are ready for inclusion in the Work Programme for the Third Call for Proposals.

Another important aim was to assess the level of ambition and critical mass associated with each research topic, as well as the degree of readiness of potential proposers, and to what extent the topic can integrate different kinds of actions, such as research, demonstration, training, take-up, dissemination, etc. This helped to decide which instruments were best suited to each research topic.

Description of the analysis procedure

EoI forms were submitted by upload to the CORDIS website, not on paper, making it possible to handle the process electronically. The Commission staff checked the assignment of EoIs to different research areas and identified cross-cutting EoIs which could be linked to more than area. A screening process then identified EoIs that were for instance "out of scope" of the Specific Programme for Medium-Long Term Sustainable Energy System, or "incomplete" and so could not be meaningfully analysed, or "duplicates" for some reason (e.g. earlier versions of re-submissions).

The assessment focussed on the identification of priority research topics, not on the assessment of the individual EoIs. The aim was to assemble a list of priority research topics drawing together ideas from individual and clusters of EoIs. In identifying and prioritising topics and suggesting the most appropriate instruments, account was taken of the criteria in the following Box :

Topic Assessment Criteria

Relevance to programme objectives

Does the topic fit well within the scope of the programme and its objectives? Does the topic require a European mobilisation of activities and resources?

Potential impact

Is it ambitious enough to make a strategic impact on sustainable development, energy, environment, competitiveness, security of supply, European Research Area, & other EC policies?

Feasibility

Do the EoIs indicate that this topic is mature enough to generate excellent proposals? What is the feasibility of success, given the apparent state of readiness and degree of excellence of the potential proposers?

The outcome was a set of topics for each research area, assessed against the above criteria, with clearly defined scope, objectives and instruments. The topics are listed in Annexe B.

Coverage of the Programme Objectives

The EoIs covered all topics mentioned in the specific programme, with many being submitted by well-known participants from the European research community and beyond. It was therefore possible to identify a number of priority topics for consideration when revising the Work Programme for the Calls in 2004-5. However, there were few real surprises so the exercise served to confirm the findings from the parallel consultations which having been going on with stakeholders and the Advisory Group and Programme Committee for Sustainable Energy Systems. In general, a substantial number of EoIs showed a credible readiness for the forthcoming calls and included suitable actors and partnerships for the actions proposed.

Conclusions and recommendations

It is concluded that the Expression of Interest exercise has again proved useful in providing guidance to the Commission in how best to revise the Work Programme and define the content of the next Calls. The results of the EoI analysis will be used along with the advice from stakeholders in the sustainable energy research community and the Commission's Advisory Group and Programme Committee for Sustainable Energy Systems who have contributed to the wider consultations. In consultation with the Programme Committee, the Commission will proceed now to the revision of the Work Programme and the detailed definition of the forthcoming Calls.

The Commission would like to express its sincere thanks to the experts who assisted in the analysis of the large number of EoIs received and the identification and definition of the topics described in this report.

Publishable Reports and EoIs for CORDIS

In the Official Journal announcement of the EoI exercise, the Commission undertook to publish on CORDIS by the end of May or early June 2004 a report on the EoI analysis, along with copies of the publishable EoIs. The present non-confidential report is thus intended for publication. There is no identifiable mention of any EoIs within the report, and moreover, the Commission will only publish EoIs where permission was granted by the authors on their submission forms. This will be the only form of feedback to the submitters and the wider research community.

Annexe A. Statistics

Table 1 Eols by Activity Code and Instrument type

| ACTIVITIES | TOTAL | INSTRUMENTS | | | |
|--|------------|-------------|-----------|------------|-----------|
| | | IP | NOE | STREP | CA |
| SUSTDEV-1.2.1 FUEL CELLS | 56 | 26 | 2 | 26 | 2 |
| SUSTDEV-1.2.2 HYDROGEN | 39 | 19 | 1 | 17 | 2 |
| SUSTDEV-1.2.3 ELECTRICITY | 56 | 20 | 5 | 24 | 7 |
| SUSTDEV-1.2.4 PHOTOVOLTAICS | 59 | 14 | 4 | 35 | 6 |
| SUSTDEV-1.2.5 BIOMASS | 67 | 29 | 9 | 26 | 3 |
| SUSTDEV-1.2.6 OTHER RENEWABLE ENERGIES | 57 | 19 | 4 | 33 | 1 |
| SUSTDEV-1.2.7 CO2 CAPTURE & STORAGE | 48 | 14 | 2 | 30 | 2 |
| SUSTDEV-1.2.8 SOCIO-ECONOMICS | 37 | 8 | 2 | 22 | 5 |
| TOTAL | 419 | 149 | 29 | 213 | 28 |

Table 2 Eols by Activity Code and Submitting Organisation type

| ACTIVITIES | TOTAL | ORGANISATION | | | | | | |
|--|------------|--------------|----------|-----------|------------|------------|----------|----------|
| | | GOV | INO | PUC | PRC | PNP | EEIG | JRC |
| SUSTDEV-1.2.1 FUEL CELLS | 56 | 21 | | 3 | 17 | 13 | | 2 |
| SUSTDEV-1.2.2 HYDROGEN | 39 | 13 | | 3 | 14 | 7 | 1 | 1 |
| SUSTDEV-1.2.3 ELECTRICITY | 56 | 17 | | 5 | 18 | 15 | 1 | |
| SUSTDEV-1.2.4 PHOTOVOLTAICS | 59 | 23 | 1 | | 9 | 26 | | |
| SUSTDEV-1.2.5 BIOMASS | 67 | 33 | | 4 | 9 | 18 | 1 | 2 |
| SUSTDEV-1.2.6 OTHER RENEWABLE ENERGIES | 57 | 25 | | 5 | 12 | 12 | 1 | 2 |
| SUSTDEV-1.2.7 CO2 CAPTURE & STORAGE | 48 | 18 | | 12 | 13 | 5 | | |
| SUSTDEV-1.2.8 SOCIO-ECONOMICS | 37 | 12 | 2 | 6 | 9 | 7 | | 1 |
| TOTAL | 419 | 162 | 3 | 38 | 101 | 103 | 4 | 8 |

GOV Governmental, INO International Orgn, PUC Public Commercial Orgn, PRC Private Commercial Orgn, PNP Private Non Profit Orgn, EEIG European Economic Interest Group, JRC Joint Research Centre

Table 3 Eols by Activity Code and Funding range

| ACTIVITIES | TOTAL | FUNDING (range on M€) | | | | | |
|--|------------|-----------------------|-----------|------------|-----------|-----------|-----------|
| | | 0-1 | 1-2 | 2-5 | 5-10 | 10-15 | 15- |
| SUSTDEV-1.2.1 FUEL CELLS | 56 | 4 | 10 | 17 | 13 | 6 | 6 |
| SUSTDEV-1.2.2 HYDROGEN | 39 | 3 | 13 | 11 | 5 | 5 | 2 |
| SUSTDEV-1.2.3 ELECTRICITY | 56 | 8 | 12 | 21 | 6 | 4 | 5 |
| SUSTDEV-1.2.4 PHOTOVOLTAICS | 59 | 5 | 23 | 18 | 7 | 6 | |
| SUSTDEV-1.2.5 BIOMASS | 67 | 4 | 10 | 27 | 14 | 12 | |
| SUSTDEV-1.2.6 OTHER RENEWABLE ENERGIES | 57 | 7 | 10 | 26 | 9 | 2 | 3 |
| SUSTDEV-1.2.7 CO2 CAPTURE & STORAGE | 48 | 4 | 7 | 25 | 8 | 2 | 2 |
| SUSTDEV-1.2.8 SOCIO-ECONOMICS | 37 | 16 | 14 | 6 | 1 | | |
| TOTAL | 419 | 51 | 99 | 151 | 63 | 37 | 18 |

Table 4 Eols by Country and Instrument type

| COUNTRY | TOTAL | INSTRUMENTS | | | |
|-----------------------------------|------------|-------------|-----------|------------|-----------|
| | | IP | NOE | STREP | CA |
| AT Austria | 8 | 3 | | 3 | 2 |
| BE Belgium | 17 | 9 | | 6 | 2 |
| CZ Czech Republic | 1 | | | 1 | |
| DE Germany | 78 | 27 | 5 | 42 | 4 |
| DK Denmark | 20 | 7 | 1 | 12 | |
| ES Spain | 34 | 12 | 3 | 17 | 2 |
| FI Finland | 9 | 2 | | 7 | |
| FR France | 49 | 15 | 5 | 25 | 4 |
| GR Greece | 15 | 7 | | 6 | 2 |
| HU Hungary | 1 | | | 1 | |
| IE Ireland | 5 | 3 | | 2 | |
| IT Italy | 33 | 13 | 2 | 16 | 2 |
| LT Lithuania | 1 | | | 1 | |
| NL Netherlands | 42 | 12 | 4 | 23 | 3 |
| PL Poland | 8 | 2 | 1 | 4 | 1 |
| PT Portugal | 3 | | 1 | 2 | |
| SE Sweden | 7 | | 2 | 5 | |
| SI Slovenia | 1 | | | | 1 |
| SK Slovakia | 1 | | | | 1 |
| UK United Kingdom | 38 | 15 | 2 | 20 | 1 |
| Total Member Countries | 371 | 127 | 26 | 193 | 25 |
| BG Bulgaria | 1 | 1 | | | |
| CH Switzerland | 6 | 3 | | 3 | |
| IL Israel | 3 | 1 | | 2 | |
| IS Iceland | 3 | 2 | | 1 | |
| NO Norway | 13 | 4 | | 8 | 1 |
| RO Romania | 8 | 5 | 1 | 2 | |
| TR Turkey | 5 | 1 | 1 | 2 | 1 |
| Total Associated Countries | 39 | 17 | 2 | 18 | 2 |
| CO Colombia | 1 | 1 | | | |
| CU Cuba | 1 | 1 | | | |
| HR Croatia | 1 | | | 1 | |
| MA Morocco | 1 | | 1 | | |
| RU Russia | 2 | | | 2 | |
| TN Tunisia | 1 | 1 | | | |
| UA Ukraine | 2 | 2 | | | |
| Total Third Countries | 9 | 5 | 1 | 3 | |
| GRAND TOTAL | 419 | 149 | 29 | 214 | 27 |

Annexe B. Tables of topics for different fields of research

Fuel cells

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|-------------------|---------------------------|
|-------------------|---------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

Development of low cost High Temperature FC systems and components with improved performance (SOFC, MCFC) IP - NOE - STREP

High Temperature Fuel Cells: Fundamental Materials Research for intermediate temperature operation (500°C-600°C), manufacturing processes and recycling; Development of materials components (new catalysts, better electrodes, bipolar plates, etc.) with better performance and durability.

High Temperature Fuel Cell System integration for 1-5 kW domestic CHP and automotive APU's: to develop Fuel Cell applications with intermediate temperature SOFC with a sufficient durability (40,000 hours for stationary and about 5,000 hours for transport applications)

Large high temperature Fuel Cell stack and system development (MW scale) for stationary power and/or CHP and transport: to develop large high temperature Fuel Cells stacks and related systems with a sufficient durability and at competitive cost.

Development of low cost Low Temperature FC systems and components with improved performance (PEMFC, DMFC, AFC) IP - NOE - STREP

RTD on innovative functional materials for low temperature Fuel Cells: fundamental materials research to reduce cost and improve performance and durability on fuel cell and components, including high temperature (more than 120°C PEM) operation, manufacturing processes and recycling.

Low Temperature Fuel Cell System integration, including development of BoP components for 1-5 kW domestic CHP: to develop PEMFC Fuel Cells and components for stationary and transport applications. Research on new electrolytes for AFC system is included but would need to be competitive to PEMFC.

Generic fuel processing for transport applications: to develop multifuel processor for transport applications such as maritime, aeronautics and road transport in the range of 5KW to 50KW, including APU applications IP - STREP

Optimised FC systems and components for hybrid vehicles: development of essential components and systems technologies needed to mature hybrid FC energy systems, e.g. hybrid concepts which facilitate FC's operations with high reliability, lifetime and efficiency; modular concepts for hybrid systems; advanced battery systems for hybrid and "plug-in" hybrid applications. IP

LIST OF TOPICS

Fuel Cells (continued)

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Other topics which were discussed, some of which show promise

Generic tools for FC systems modelling and testing, safety and quality assurance: to develop tools for modelling and testing FC, stacks, components and systems, including general mathematical models and addressing the need for validation and benchmarking of test procedures and evaluation methods. NOE - STREP

Optimised RES-based FC systems including integrated RES hydrogen production, fuel cell/electrolyser, hydrogen storage, CO2 capture: to develop complete energy systems from H2 production (fossil with CO2 capture & renewable) to electricity control and management for residential and stationary applications. IP

LIST OF TOPICS

Hydrogen

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|--|-------------|
| Advanced concepts for electrochemical Hydrogen Production: development of highly-efficient electrochemical systems and assessment of their potential integration with renewable energy sources, in order to obtain a zero-emission hydrogen production system. | STREP |
| Develop and benchmark clean cost-effective technologies and processes for the production of hydrogen using concentrated solar radiation See Solar section for details. | IP |
| Development of advanced small fuel processing units for decentralised hydrogen production: to develop new, efficient and cost-effective small scale reformer processors of gas and liquid fuels for decentralised production of hydrogen for both stationary applications and hydrogen dispensers for transport. | STREP |
| Development of innovative materials and novel storage methods, which could lead to breakthrough solutions for hydrogen storage: Multidisciplinary research on advanced and novel materials and methods for radically new solid hydrogen storage media for stationary and transport applications. | NOE - STREP |
| Pre-normative research for regulations and standards for hydrogen dispensers and hydrogen refuelling stations in the EU: to generate the knowledge base for a legislative framework for a cost-efficient approval process for compressed gaseous and liquid hydrogen dispensers and filling stations across Europe. | STREP |
| Large scale clean, cost-effective hydrogen production from pre-combustion decarbonisation of fossil fuels See CO2 section for details | IP |
| Techno-socio-economic impact assessment of hydrogen energy technologies and implementation pathways: to support the objectives of the H2/FC Technology Platform with respect to hydrogen energy technologies and roadmaps. | IP - CA |

Other topics which were discussed, some of which show promise

| | |
|---|-------|
| Novel, unconventional renewable routes for hydrogen production Bacteria use for a photosynthetic production of cost-effective hydrogen. | STREP |
|---|-------|

LIST OF TOPICS

Electricity

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|--|------------|
| Development and validation of advanced grid architectures for enabling the large integration of DER within local LV distribution networks, including micro-grids, which could be operated interconnected to other networks or islands. | IP - STREP |
| Advanced power electronic converters for the European Electricity Network: Development and validation of new power electronic converters for transmission and distribution networks, designed to optimise power transmission capabilities, improve power quality and reliability, minimise losses and cost, etc. | STREP |
| European Coordination Action for Distributed Energy Resources: to overcome the high level of fragmentation into national research structures by consolidating all European DER research activities and by developing an integrated European standardisation. | CA |
| Development and testing of HTS devices to improve the performance, stability and efficiency of electricity networks, with an emphasis on the engineering of functional devices and their application and operation to demonstrate functionality and system benefits. | STREP |
| Operational concepts and tools for maximising the value of DG/RES in electrical power systems (Large-Scale Virtual Power Plant): development and validation of Decentralised Energy Management Systems with high penetration of DG/RES, while maintaining the stability and power quality of the distribution networks. | IP |
| Preparing the future Electricity Transmission Network: feasibility study on setting up a EU Energy Grid Research Body, co-financed by TSOs and other relevant actors, whose objective would be to co-ordinate the R&D needs for the design, development and validation of concepts of the Future European Electricity Network, compatible with a large penetration of RES and DG. | CA |

Other topics which were discussed, some of which show promise

| | |
|---|-------|
| Electricity Storage Solutions for DER: technically and economically viable stationary storage solutions dedicated to DER with a timescale of seconds to hours, for applications like peak shaving, load management and power quality. | STREP |
| European co-ordination for electricity storage solutions in electricity networks: to enable an optimal integration of planning procedures, methodologies for regulatory framework, technical requirements and measuring systems of existing, emerging and new storage technologies applied to DER in power networks. | CA |
| Managing the Impact of Intermittent Renewable Energy Generators on Power Grids: development of concepts and tools capable of minimising the impact on the European Transmission Grid of fluctuating renewable generators. | STREP |

LIST OF TOPICS

Photovoltaics

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|---|-------|
| Advanced techniques for low-cost thin-film cells and modules to provide the basis for industrial mass production of cost-effective highly-efficient thin-film cells and modules | IP |
| Significant reduction of cost of silicon-based PV using solar-grade instead of electronic-grade silicon feedstock for wafers and cells aiming at a 6-month energy payback and efficiencies close to those of commercial silicon-cells | STREP |
| Development of advanced techniques for MW-scale production of cadmium-free large-area solar modules based on CIS thin-film materials using electro deposition techniques | STREP |
| In order to improve the quality assurance of PV technologies, pre-normative actions should be carried out in an integrated way to assess all the factors contributing to the performance, especially in view of establishing BIPV codes | IP |
| To develop innovative and environmentally-friendly manufacturing techniques for the production of cost-effective silicon cells and modules with high performance | IP |
| To bring together European Research Groups concerned with the development of low-cost and stable organic PV cells and modules using various means of information exchange | CA |

Other topics which were discussed, some of which show promise

| | |
|--|-------|
| Development of portable integrated PV systems for innovative applications, like integration in textile structures or for compact mobile electric and electronic devices | STREP |
| Compact and cost-effective concentration technologies developing PV modules with high-concentration using reflective or refractive optical elements for applications in high irradiation countries | STREP |

LIST OF TOPICS

Biomass

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

Research and development of cost efficient liquid biofuel production systems from biomass with an emphasis on lignocellulosic feedstock, with the objective of process optimisation from laboratory to pilot scale. IP - NOE - STREP

Energy from crops, forest and bio-residues to develop innovative, low-emission reliable waste-to-energy and crop-to-energy concepts including logistics, conversion and standardisation. IP - STREP

Innovative methods for cost effective production and coupling of biofuels to fuel cells including production, upgrading and testing of suitable biofuels. STREP

Integrated production of energy and other products through the concept of "Biorefinery" to enhance their economic viability and to provide a critical mass for the development of low-cost bio-energy, bio-chemicals and other bio-based materials. STREP

New and innovative processes for the production of hydrogen-rich gas, syngas or fuel gas from biomass using a very broad feedstock and process basis, both thermal and non-thermal. IP - STREP

Reliable, efficient and cost effective biomass combustion and co-firing technologies with significant reduction of atmospheric pollutants including large scale systems with multi-fuel resources and small scale systems using standardised biomass feedstock. STREP

LIST OF TOPICS

Wind

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

Forecasting and power prediction for MW off-shore wind farms by integration of existing tools into a global model, to assess and predict power efficiencies to reduce techno-economic risk related to wind farm installations. CA

Innovative materials, modelling and designs from foundations to blades of future robust, reliable, light-weight and efficient wind energy converters with reduced environment impact. IP

Wind turbine testing and standardisation to aim at future certification of wind turbine components and performance for a better market opening, in particular for new and replacement components at manufacturers and users' levels. CA

Other topics which were discussed, some of which show promise

Hybrid ocean wave and wind energy converter STREP

LIST OF TOPICS

Geothermal

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

Co-ordination of research and technology- and information transfer in the field of EGS, with the objective to define best practices and identify and overcome barriers to the wider uptake of EGS technology

CA

Development of improved exploration methods for deep geothermal sources, aimed in particular at innovative, integrated geophysical techniques for the detection of deep fractured and/or fluid bearing zones

IP - STREP

Other topics which were discussed, some of which show promise

Advanced technologies for combined heat and power (CHP) utilising new or improved power cycles in order to increase the overall efficiency and cost-effectiveness of power production from low/medium enthalpy geothermal sources.

STREP

Development of advanced tools and techniques for developing and harnessing very high temperature unconventional geothermal resources

STREP

LIST OF TOPICS

Ocean

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|---|-------|
| Development and sea testing of Ocean Energy prototypes of intermediate to full scale with the objective to obtain operational experience of devices whose state of development indicate a potential for economic viability and that are suitable for large scale prototype investigation under real sea conditions. | STREP |
|---|-------|

| | |
|--|----|
| Ocean energy research for next generation devices with the objective of creating an integrated structure for addressing known technological barriers and knowledge gaps in the field of design and technology development. | IP |
|--|----|

Other topics which were discussed, some of which show promise

| | |
|--|-------|
| Upscaling to MW scale and sea testing of tidal current converter prototypes that have already been proven at smaller size. | STREP |
|--|-------|

| | |
|---|----|
| Development of prototypes to extract energy from ocean salinity gradient for electricity production based on innovative and integrated membranes. | IP |
|---|----|

LIST OF TOPICS

Concentrated Solar Thermal

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|--|-------|
| Benchmarking and proofing of the production of solar enhanced energy carriers, in particular hydrogen, using concentrated solar thermal technologies, through development and testing of CST components at a pre-industrial scale. | IP |
| Development and testing of next generation concentrated solar thermal technologies, providing proof of concept or of technical reliability by improving and optimizing the components of dish, tower and trough concepts. Process heat production and Direct steam generation is of particular interest. | STREP |
| Development of hybrid components for concentrated solar thermal technologies allowing the dual use of solar energy and other fuels | STREP |

LIST OF TOPICS

CO₂ capture and storage

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Topics which were considered to be relevant and mature enough to generate good proposals

| | |
|--|-------|
| Advanced separation techniques: to develop new and innovative separation techniques such as membranes, sorbents, PSA, TSA, etc, for the separation of CO ₂ from flue gas or partially oxidised gases, to obtain a highly pure CO ₂ stream. | STREP |
| CO₂ capture and hydrogen production from gaseous fuels: research and develop various technologies to produce hydrogen and capture CO ₂ from gaseous fuels, select the most promising one and take it to pilot stage. | IP |
| CO₂ storage monitoring and verification: to prove the reliability and safety, in the long term, of geological CO ₂ storage, provide the R&D necessary to have a basis for monitoring and verification leading to guidelines for site certification and accepted standards. | IP |
| European Coordination and networking activities in CO₂ capture and storage: to promote the coordination of existing EU funded RTD activities in the field of CO ₂ capture and storage, establish the EU as a centre of excellence in the field and provide strategy definition and road mapping. | CA |
| Oxyfuels combustion and new oxygen production techniques: to develop oxyfuel combustion cycles and their main components - innovative and advanced separation techniques for oxygen production, turbomachinery design to work with new gas mixtures containing CO ₂ , basic combustion research in high oxygen environment and CO ₂ rich environment and assessment of new ways to separate oxygen. | STREP |
| Preparing for large scale European H₂ production from fossil fuels with CO₂ capture and geological storage: key aspects are size, sites, technologies, stakeholders, financing mechanisms, environmental issues, public acceptance issues, legal and regulatory hurdles to build facilities. | IP |
| R&D for large scale CO₂ transport: assessment of CO ₂ purity and identification of contaminants in terms of safety and materials behaviour, development of new CO ₂ transport concepts and synergies with existing infrastructure (ex: pipelines, ships, etc.) and materials research. | STREP |

LIST OF TOPICS

CO₂ capture and storage (continued)

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
|----------------------|------------------------------|

Other topics which were discussed, some of which show promise

| | |
|--|-------|
| Chemical looping: to develop and prove the concept to a pilot plant scale test of the order of 1MW, with experimental tests including materials, material behaviour, etc to allow an efficient transfer of the reactive materials for CO ₂ capture and possibly hydrogen production. | STREP |
| Enhanced coal bed methane CO₂ storage: to assess and validate the potential in terms of capacity and reliability of ECBM CO ₂ storage in Europe, involving monitoring - risk assessment - verification - reliability - safety - cost analysis - modelling. | STREP |
| Innovative Mineral CO₂ Storage: to assess and stimulate innovative solutions on the route to the mineral storage of CO ₂ and the development of suitable mineralisation routes, considering the economic and environmental implications of the processes. | STREP |
| Mapping geological CO₂ storage potential matching sources and sinks: to assess the potential for CO ₂ geological storage in areas of Europe where it has not been done, particularly in Eastern and Southern Europe, and the development of site selection criteria. | STREP |
| Network of excellence on CO₂ capture: to promote a durable integration of excellence in EU research centres in the field of CO ₂ capture. | NOE |

LIST OF TOPICS

Socio-economics

The order of listing of the topics is not significant

| DESCRIPTIVE TITLE | APPROPRIATE INSTRUMENT(S) |
|----------------------|------------------------------|
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Topics which were considered to be relevant and mature enough to generate good proposals

Methods for the economic and environmental assessment of power generation, including externalities and security of supply with the objective to analyse and compare present and future power generation costs, investment behaviour and decision-making processes in the electricity sector, including externalities such as acidification, eutrophication or visual intrusion. STREP - CA

Modelling, forecasting, integrated assessment and new paradigms for a low carbon energy sector with the objective to develop quantitative and qualitative forecasting methods for the medium and long term (2030-2100) focusing on EU policy issues (Kyoto, emissions trading, renewable targets, etc.) and identifying new paradigm shift, future life-styles, energy service needs and emerging technologies. IP - STREP

Social acceptability, behavioural changes and international dimension related to sustainable energy RTD with the objective to develop social acceptance measurement tools applicable in the EU and EU neighbouring countries to promote the use of Renewable Energy Technologies and to extend the measures of Rational Use of Energy. STREP - CA

Other topics which were discussed, some of which show promise

Energy planning and policy benchmarking: to develop innovative energy and environmental planning tools, mainly for local systems (energy efficiency, land-use, district heating, biofuels, etc.) and to compare new concepts for clean heat and electricity production. STREP - CA

Socio-economic instruments for a clean energy policy in the Mediterranean area: to promote new Renewable Energy Technologies (RET) planning and financing methods in the Southern and Eastern Mediterranean Countries including the identification of adequate RET and policies for this area. STREP - CA