

WORK PROGRAMME 2013

COOPERATION

THEME 5

ENERGY

(European Commission C(2012)XXX)

ANNUAL WORK PROGRAMME 2013

I.	CONTEXT	Errore. Il segnalibro non è definito.
I.1.	Political landscape	Errore. Il segnalibro non è definito.
I.2.	Approach for 2013.....	Errore. Il segnalibro non è definito.
I.3.	International cooperation	Errore. Il segnalibro non è definito.
I.4.	Cross Thematic approaches	Errore. Il segnalibro non è definito.
I.5.	Socio-economic dimension of research.....	Errore. Il segnalibro non è definito.
I.6.	Gender dimension	Errore. Il segnalibro non è definito.
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IV.	OTHER ACTIONS	Errore. Il segnalibro non è definito.
V.	BUDGET.....	Errore. Il segnalibro non è definito.

I. CONTENT OF CALLS

This section describes all the topics for which proposals will be called in this work programme. This concerns only the content of the calls. For the practical modalities related to these calls, please refer to section III 'Implementation of calls'. For actions not implemented through calls for proposals, please refer to section IV 'Other actions'.

I.1. Activity Energy.1: Hydrogen and Fuel Cells

Starting from 2009, the topics in this Activity are defined in the Annual Implementation Plan of the Fuel Cells and Hydrogen Joint Undertaking (FCH JU), established on the basis of Article 187 TFEU (ex-Article 171 TEC). The FCH JU is an industry led public private partnership (PPP) which defines and manages a strategic, target-oriented research and development programme to support the broad market introduction of fuel cell and hydrogen technologies.

The FCH JU covers fundamental, industrial and applied research as well as demonstration and relevant cross-cutting activities. The detailed programme of activities is decided by its Governing Board. Therefore, such activities are not longer covered within this work programme.

I.2. Activity Energy.2: Renewable Electricity Generation

Research into, development and demonstration of integrated technologies for electricity production from renewables, suited to different regional conditions where sufficient economic and technical potential can be identified, in order to provide the means to raise substantially the share of renewable electricity production in the EU. In order to reach the target of 20% share of renewables in the EU final energy consumption by 2020, research should increase overall conversion efficiency, cost efficiency, significantly drive down the cost of electricity production from indigenous renewable energy resources including biodegradable fraction of waste, enhance process reliability and further reduce the environmental impact and eliminate existing obstacles.

II.2.1. Area Energy.2.1: Photovoltaics

Topic ENERGY.2013.2.1.1: Solar Tower Systems combining high-performance concentrated photovoltaics and thermal power generation/conversion

Description of topic: Concentrating photovoltaics (CPV) has been studied extensively during the last three decades. Several megawatt-sized CPV installations using multi-junction solar cells arranged in flat modules are now deployed with full-scale system operating efficiencies up to 25% AC, with potential for further advances in conversion efficiency. However, the complex module structure, drive mechanism and electronic control required in a concentrating system to accurately track and focus sunlight increase considerably its cost and weaken its reliability. A significant progress is therefore needed both in components and in system concepts. Following promising lab-scale studies on dense-array CPV receivers as well as on spectral splitting, a possible route to be further developed is to use a tower concentration scheme - a concept which is well established in concentrated solar power (CSP).

According to this hybrid approach, part of the solar energy collected by a heliostat field could be converted at high efficiency thanks to the optimized bandgap of CPV cells. The balance of the power would then be available as thermal energy for applications ranging e.g. from remote heating/cooling to further electricity production. This could result in an improvement of the overall cost effectiveness of concentrated solar power plants.

The combination of CPV and CSP technologies would allow the exploitation of several synergies, such as:

- better overall conversion efficiency;
- heat removal from the CPV receiver and its utilisation;
- improvement of sun-tracking effectiveness with respect to conventional CPV flat-modules;
- more flexibility in plant sizing in comparison to conventional tower CSP, whose minimum size is strongly constrained by the requirements of thermodynamics;

The project will therefore demonstrate novel, efficient and cost-effective approaches for solar tower systems combining high-performance concentrated photovoltaics and thermal power generation/conversion. The main focus of the research is expected to be on the development of components such as concentration optics, receivers, filters/splitters, as well as on the thermodynamic optimization of the combined system. This topic aims at testing the feasibility "in the field" of such systems and their potential for industrial-scale deployment. System design, economic analysis, proof-of-concept and demonstration at minimum industrial pilot scale for such systems are envisaged.

Expected impact: (i) Solutions going well beyond the state-of-the-art in terms of energy conversion rate of the absorbed solar radiation and cost efficiency; (ii) acceleration of the industrial take-up of promising pilot-scale solutions; (iii) support to the development of large impact project such as DESERTEC.

This topic supports the implementation of the Solar European Industrial Initiative of the SET-Plan (SEII) and the resulting project(s) will form part of the EII.

Additional information: The projects shall establish links with relevant industrial stakeholders with potential interest in the exploitation of this technology. In the framework of the EIIs a specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and the selected projects will be expected to participate.

Topic ENERGY.2013.2.1.2: Support to key activities of the European Photovoltaics Technology Platform (TP PV)

Content/scope: The objective of this support action is to provide support to those activities of the European Photovoltaics Technology Platform which are of interest for the photovoltaics community as a whole, and for the general public.

Such activities may include:

- Analysis and follow-up of the technological, regulatory, financial and market context of photovoltaics in Europe and in the World, and providing open information on these issues through reports, factsheets, newsletters, website or other means.
- Dissemination, discussion and/or networking events open to all photovoltaics stakeholders.
- Updating of the TP PV Strategic Research Agenda when necessary, and assessment of its implementation in Europe.
- Coordinating the contribution of the photovoltaics community to the Solar European Industrial Initiative (SEII).

The implementation of these activities shall involve close collaboration with TP PV. However they should aim at involving and serving the photovoltaics community as a whole, including PV TP members, other industry and academia stakeholders, the public sector, and civil society organisations.

Funding scheme: Coordination and support action (supporting action)

Expected Impact: It is expected that an increased cohesion of the photovoltaics sector will be reached through constructive and inclusive debates, and thanks to the availability of scientifically sound, transparent and objective information for all interested parties. Increased communication between research and industry actors will facilitate exploitation of research results and hence the deployment of high-efficient and competitive photovoltaics technologies. Collaboration with the SEII will provide the initiative with adequate input from a wide spectrum of photovoltaics stakeholders, which is expected to facilitate the development and implementation of its different activities on a sound basis.

II.2.2. Area Energy.2.2: Biomass

No topics are opened in this area.

II.2.3. Area Energy.2.3: Wind

No topics are opened in this area.

II.2.4. Area Energy.2.4: Geothermal

Topic ENERGY.2013.2.4.1: Exploration and assessment of geothermal reservoirs

Content /Scope: The aim of this research is to develop reliable exploration methods for deep geothermal reservoirs, which are to be exploited through Enhanced Geothermal Systems (EGS). It will embrace geophysical, geological and geochemical knowledge through an interdisciplinary approach.

The project will investigate all accessible information from resource location, structural geology and estimation of the in-situ stresses, to geophysical and geochemical data. The potential of supercritical fluids should also be explored.

Methods to acquire and validate the information should be applied at promising sites. This should involve laboratory and downhole measurements in order to characterise different in-situ properties of reservoir rocks or aquifers and be validated through downhole measurements. The final result should be scientifically sound methods to assess the potential of geothermal reservoirs prior to exploration and utilisation, including appropriate software development.

Funding scheme: Collaborative Project

Expected Impact: Geothermal energy is a low-carbon, non-intermittent renewable energy source that is available at many places. Main bottlenecks for a more widespread use of geothermal energy are the high initial investment costs and the uncertainty of exploitation of the geothermal reservoir. The developed reliable science based exploration and assessment methods for geothermal reservoirs under this topic would address this latter bottleneck and therefore significantly enhance the potential of geothermal energy in the energy mix. It will also foster the deployment of geothermal energy and will further strengthen the leading role of the European Union in EGS technology.

Additional information: Up to one project might be funded.

II.2.5. Area Energy.2.5: Concentrated Solar Power

Topic ENERGY.2013.2.5.1: Methods for the estimation of the Direct Normal Irradiation (DNI)

Contents/scope: The objective of the topic is to support the development and validation of a method for the estimation of the Direct Normal Irradiation (DNI). The method developed will have to estimate the DNI at a spatial and temporal scale which is relevant to the needs of a Concentrated Solar Power (CSP) plant. Besides cloudiness, the method will have to take into account the other factors which can affect the DNI (e.g. aerosols).

The method shall be validated against ground measurement data.

Funding scheme: Collaborative Project

Expected impact: Current methods provide estimates with errors of $\pm 15\%$. The method developed will provide reliable forecasts of the DNI. This will reduce the uncertainties on the one hand of the prefeasibility studies of new CSP plants, and on the other hand of the electricity production of CSP plants in operation.

This action supports the implementation of the Solar European Industrial Initiative of the SET-Plan (SEII), in particular with regard to the optimization of CSP plants operation.

Additional information: Up to one project may be funded.

In the framework of the EIIs a specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and the selected projects will be expected to participate.

II.2.6. Area Energy.2.6: Ocean

Topic ENERGY.2013.2.6.1: Design and operation tools for ocean energy converter arrays

Content/Scope: For many years, different (wave and tidal/current) ocean energy devices have been individually supported by the EU programmes. Recently, some have been connected to the grid to produce electricity. An important next stage to exploit the ocean energy potential is to install several identical devices within an array like done in wind farms to raise their overall electricity production. However, the way those devices will perform is critically linked to their setup and operation parameters.

The objective of the research is therefore to develop design and operation tools for ocean energy converter arrays. Research and development are needed on many aspects such as single-device resource forecasting methodology, power generation optimisation, balance of system, monitoring and interconnection when applied to multiple-devices systems. Development of fault-tolerant ocean energy arrays control systems including device failure identification and auto-reconfiguration capabilities also need to be considered. Ideally the tools developed should be applicable to as many devices as possible and under different site conditions. However, device dependant aspects are unavoidable and the project should possibly validate the tools on at least two types of devices, where possible using existing installations.

Funding scheme: Collaborative Project

Expected impact: The optimisation of the design and operation of ocean energy arrays will contribute to a better use of the ocean energy resource and hence to a better cost competitiveness, which will pave the way to a large-scale deployment of ocean energy systems. This deployment would bring a strong balancing effect to offshore wind electricity production due to its easier predictability and a dephasing effect, leading to a valuable complementary impact on power quality and value.

Additional information: Experience from the aerospace and automotive industries as well as links with the wind offshore activities, should be brought in. This aspect will be taken into consideration in the evaluation.

Up to two projects may be funded.

II.2.7. Area Energy.2.7: Hydro

Topic ENERGY.2013.2.7.1: Optimisation of Water Turbines

Content/Scope: The activities under this topic will focus on research and development to optimise water turbines in order to increase their output capacity and reduce energy consumption through hydraulic and mechanical equipment and system optimisation, both for conventional and pumped storage hydro turbines. The proposals shall cover the whole optimisation range from modelling, hydraulic and mechanical design to prototype testing and validation allowing in particular to cope with frequent and large load changes and significant water level variations.

The aims are significant improvements in performance, life time, larger operating ranges, faster unit responses of the turbines resulting in a more efficient use of hydro resources.

The active participation of industrial partners and technology suppliers active in the sector is essential to form a multidisciplinary consortium able to promote the innovative results of the project and to achieve full impact of the projects at European level. This will be considered during the evaluation under the 'Implementation' criterion.

Funding Scheme: Collaborative Project

Expected impact: The highly efficient water turbines with larger operating ranges and faster unit response developed in this project will increase the efficiency of hydro power generation and storage and significantly contribute to better integration of renewable energies into the grid.

Proposals will have to include a clear plan for the exploitation of the scientific and technical results. This will be considered during the evaluation under the 'Impact' criterion.

II.2.8. Area Energy.2.8: Innovative Integration of Renewable Energy Supply and Energy Efficiency in Large Buildings and/or Concerto Communities

No topics are opened in this area.

II.2.9. Area Energy.2.9: Cross-Cutting Issues

Topic ENERGY.2013.2.9.1: Research cooperation and knowledge creation in the area of renewable energy in Mediterranean partner countries

Content/scope: The Mediterranean Partner Countries (MPC) possess a vast potential of renewable energy resources. However, their research and development capacities to make most of this potential for both domestic use and export need strengthening. At the same time, European research centres would benefit from the possibility to test and validate new technologies in real conditions. One way to support both aims is to promote exchange of researchers, training through research and knowledge sharing. However, for this to be fully

beneficial to MPC, such action should be coupled with capacity building and infrastructure development in the MPC.

Therefore, this topic aims to support partnerships in those areas between European centres for renewable energy research, research organisations in the MPC and related key stakeholders. Partnering organisations should identify topics of mutual interest and benefit in the area of renewable energy. The exchange would *a priori* involve a first period of joint research and development work in one or more European organisations, a second period of joint testing and validation in one or more research organisations in MPC and a third period of establishing a roadmap for further cooperation on RTD&D, technology transfer, technology deployment and research infrastructure development in the targeted areas. A balanced participation of both junior and senior researchers and other key stakeholders from both regions will be prerequisite for the grant.

Funding scheme: Collaborative Project

Expected impact: The resulting projects from this grant are expected to substantially and sustainably increase the research and development capacity in the participating organisations, to foster MPC participation in EU programmes, and to pave the way for long-standing cooperation in renewable technologies between the two regions.

Additional information: Up to 5 projects may be supported, each one involving necessarily a balanced effort in terms of manpower, R&D responsibilities and renewable energy deployment objectives between the EU and MPC partners. This will be considered during the evaluation under the 'Implementation' criterion.

N.B. The support to capacity building and research infrastructures in the MPC is very important to keep highly qualified researchers in their own countries. This activity shall establish synergies between the funding instruments for research and innovation and of the European Neighbourhood Policy.

I.3. Activity Energy.3: Renewable Fuel Production

Research into, development and demonstration of improved fuel production systems and conversion technologies for the sustainable production and supply chains of solid, liquid and gaseous fuels from biomass (incl. biodegradable fraction of waste). Emphasis should be on new types of Biofuels in particular for transport and electricity as well as on new production, storage and distribution routes for existing Biofuels, including the integrated production of energy and other added-value products through biorefineries. Aiming to deliver 'source to user' carbon benefits, research will focus on improving energy efficiency, enhancing technology integration and use of feedstock.

II.3.1. Area Energy.3.1: First Generation Biofuel from Biomass

No topics are opened in this area.

II.3.2. Area Energy.3.2: Second Generation Fuel from Biomass

Topic ENERGY.2013.3.2.1: Pre-commercial industrial scale demonstration plant on paraffinic biofuels for use in aviation

Open in call: FP7-ENERGY-2013-X

Contents/scope: The aim is to support the construction of pre-commercial plant(s) on paraffinic biofuels based on sustainable lignocelluloses feedstock. The call aims at industrially led projects with minimum installed production capacity of 40,000 tons per year. The biofuel production plants should be designed to maximise the production of biofuels aimed for use in the aviation sector. The proposals should address the complete value chain including the supply chain of the sustainable biomass resource and the use of the biofuel in the aviation market. A detailed Life Cycle Analysis and GHG calculations must be included in the proposal and will be evaluated under the "Scientific and Technological Quality" criterion.

The leading role of relevant industrial partners is essential to achieve the full impact of the projects submitted. Applicants must demonstrate that by the time of the submission of their application (deadline of the call) they have been operating demonstration scale plants with minimum installed production capacity of about 2,000 tons per year or have such plants under construction with planned commissioning the latest by 31/12/2013 (justification shall be provided in the proposal and will be evaluated under the 'Implementation' criterion). The number of operating hours by the time of the submission of the application (deadline of the call) may be an asset for the applicant.

Funding scheme: Collaborative Projects with a predominant demonstration component

Expected impact: The construction of such pre-commercial plants will accelerate the deployment of paraffinic biofuel technologies aiming to facilitate achieving the EU Biofuel FlightPath and the biofuels targets of the Renewable Energy Directive. Furthermore it will provide reasonable basis for ensuring the reliable supply of sustainable biomass resources to the plants and it will be the first step towards reducing the relative high cost of the new technologies under development.

Additional information: In addition, the proposers must provide additional information by completing Table 1 "Techno-economic Analytical data" and Table 2 "Key Performance Indicators" that have been approved by the TEAM of European Industrial Bioenergy Initiative (EIBI). Tables 1 and 2 as well as information on EIBI are made available through the relevant Guide for Applicants. The elements will be evaluated respectively under the 'Implementation' and 'Impact' evaluation criteria.

Proposals based on hydrogenated vegetable oils are not covered by this Call Topic and thus they shall be considered out of scope if submitted. The topic aims to facilitate the implementation of the SET Plan European Industrial Bioenergy Initiative (EIBI). The European Commission reserves its right to ask the project during the negotiation, to establish strong links, where appropriate, with relevant R&D projects at EU, national level.

It is envisaged that up to three projects could be funded.

II.3.3. Area Energy.3.3: Biorefinery

No topics are opened in this area.

II.3.4. Area Energy.3.4: Biofuels from Energy Crops

No topics are opened in this area.

II.3.5. Area Energy.3.5: Alternative Routes to Renewable Fuel Production

No topics are opened in this area.

II.3.6. Area Energy.3.6: Biofuel Use in Transport

No topics are opened in this area.

II.3.7. Area Energy.3.7: Cross-Cutting Issues

Topic ENERGY.2013.3.7.1: Developing regional and pan-European schemes for the sustainable delivery of non-food biomass feedstock in a pan-European integrated market

Content/scope: The sustainable and reliable supply of non-food biomass feedstock is a critical success factor for the long-term perspective of biomass-based technologies to produce bioenergy and bio-based products on a large scale while not competing with the food market.

The objectives of this project are to develop biomass logistics and trading schemes at appropriate regional and Pan-European scale. This will involve economic, social and logistics

research building on various related Research FP and IEE programme projects¹.

The schemes will take into consideration the regional conditions (soil, water, climate, protected areas, pre-treatment and conversion plants, logistics hubs, transportation routes, policy incentives, workforce, etc.) and the best available and identified plant/tree varieties, agricultural and forestry practices, harvesting, handling, pre-treatment and treatment technologies (considering also the results of all relevant pilot and demo projects²). The schemes shall be tested and validated at appropriate level in a sufficient number of regions and Member States/Associated countries.

The Pan-European dimension would highlight the optimal flows of biomass feedstock to all uses and the best possible organization of biomass pre-treatment and conversion plants at European level.

The most promising trans-European logistic supply-chains stemming from the Pan-European scheme will be further elaborated into a set of implementation plans. These plans should present notably the infrastructures needed, transport modes and flows of feedstock together with an economic analysis.

The Balkan and East Neighbourhood countries³ would be considered as part of this Pan-European scheme.

Funding scheme: Collaborative project

Expected impact: Optimal use of biomass would bring substantial environmental, economic and social benefits. It is expected that the schemes developed would support the regional and national authorities in their decisions for planning and strategy implementation. The schemes would also help industries involved in logistics, harvesting, pre-treatment and conversion of biomass for their investment decisions regarding technology, plant location, transport means and industrial operation more generally.

Additional information: Up to one project will be funded which should encompass participation from a sufficient number of countries to ensure Pan-European dimension. This will be considered during the evaluation under the 'Implementation' criterion.

N.B. This activity shall establish synergies between the funding instruments of the Regional policy and of the European Neighbourhood Policy.

ENERGY.2013.3.7.2: Support to key activities of the European Biofuels Technology Platform (EBTP)

Content/scope: The objective of this support action is to provide support to those activities of the EBTP which are of interest for the biofuel community as a whole, and for the general public.

Such activities may include:

- Analysis and follow-up of the technological, regulatory, financial and market context of biofuels in Europe and in the World, and providing open information on these issues through reports, factsheets, newsletters, website or other means.

¹ E.g. BEE, CEUBIOM, Biomass futures, Biomap, Biomass Trade Centres, BEn, Wood Heat Solutions, BioEnerGis

² E.g. Sector, Bioboost

³ Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia, Kosovo, Montenegro, Serbia, Moldova and Ukraine

- Dissemination, discussion and/or networking events open to all biofuel stakeholders.
- Updating of the EBTP Strategic Research Agenda when necessary, and assessment of its implementation in Europe.
- Coordinating the contribution of the biofuel community to the European Industrial Bioenergy Initiative (EIBI).

The implementation of these activities shall involve close collaboration with EBTP. However they should aim at involving and serving the biofuel community as a whole, including EBTP members, other industry and academia stakeholders, the public sector, and civil society organisations.

Funding scheme: Coordination and support action (supporting action)

Expected Impact: It is expected that an increased cohesion of the biofuel sector will be reached through constructive and inclusive debates, and thanks to the availability of scientifically sound, transparent and objective information for all interested parties. Increased communication between research and industry actors will facilitate exploitation of research results and hence the deployment of advanced, sustainable biofuel technologies. Collaboration with the EIBI will provide the initiative with adequate input from a wide spectrum of biofuel stakeholders, which is expected to facilitate the development and implementation of its different activities on a sound basis.

I.4. Activity Energy.4: Renewables for Heating and Cooling

Research, development and demonstration of a portfolio of technologies and devices including storage technologies to increase the potential of active and passive heating and cooling from renewable energy sources contribute to sustainable energy. The aim is to achieve substantial cost reductions, increase efficiencies, further reduce environmental impacts and optimise the use of technologies in different regional conditions where sufficient economic and technical potential can be identified. Research and demonstration should include new systems and components for industrial applications (incl. thermal sea water desalination), district and/or dedicated space heating and cooling, building integration and energy storage.

II.4.1. Area Energy.4.1: Low/Medium Temperature Solar Thermal Energy

Topic ENERGY.2013.4.1.1: Stagnation-proof solar thermal systems

Content/scope: The topic aims to support applied research, development and testing of solar thermal systems which can cope with the harmful effects of stagnation.

The project will develop solar thermal systems able to withstand high internal temperatures over the operating lifetime of the system. Improved materials, components and/or suitable control systems able to avoid or limit the degradation of the collector and of the heat transfer fluid shall be developed. The integration of the collectors in a solar thermal heating or cooling system for buildings or industrial use should be considered. Mechanisms to prevent any uncontrolled temperature increase in the hot storage should also be investigated. The project shall test the equipment at least at the pre-industrial scale.

The participation of industrial partners is essential to form a multisectorial, multidisciplinary consortium able to achieve the full impact of the project. This will be considered under the 'Implementation' criterion.

Funding scheme: Collaborative Project

Expected impact: Stagnation is still problematic for the solar thermal collectors due in particular to the overheating of collector components and systems. The novel, stagnation-proof systems to be developed in this research project would ensure better durability and present fewer risks for the installer and for the final user. This will effectively support the development of the pan-European market for solar thermal panels and the major EU Initiative on Smart Cities.

II.4.2. Area Energy.4.2: Biomass

No topics are opened in this area.

II.4.3. Area Energy.4.3: Geothermal Energy

No topics are opened in this area.

II.4.4. Area Energy.4.4: Innovative Integration of Renewable Energy Supply and Energy Efficiency in Large Buildings and/or Concerto Communities

No topics are opened in this area.

II.4.5. Area Energy.4.5: Cross-Cutting Issues

No topics are opened in this area.

I.5. Activity Energy.5: CO₂ Capture and Storage Technologies for Zero Emission Power Generation

Research, development and demonstration of technologies to drastically reduce the adverse environmental impact of fossil fuel use aiming at highly efficient and cost effective power and/ or steam generation plants with near zero emissions, based on CO₂ capture and storage technologies, in particular underground storage.

II.5.1. Area Energy.5.1: CO₂ Capture

Topic ENERGY.2013.5.1.1: Scale-up of advanced high-efficiency capture processes

Content/scope: The objective is the scaling-up of advanced capture technologies that have shown considerable potential for reduction of the energy penalty and a significant overall improvement of cost-efficiency of the whole capture process. Projects can address innovative sorbents, cryogenics or membranes, Projects should define operating conditions and provide proof of the reliability and cost-effectiveness of this concept through pilot testing, and aim for an ambitious scale-up as compared to the state-of-the-art. The proposal should state a clearly defined target for the reduction of the energy penalty and the relative incremental operating costs of the capture process.

Funding scheme: Collaborative Project

Expected impact: Progress in this area should result in a significant reduction of the energy intensity of the capture process for power plants or other energy-intensive industries, and in a substantial decrease of the cost of capture. The project should prepare the ground for pre-commercial demonstration of the technology.

Additional information: The participation of industry and innovative SMEs is particularly encouraged.

To realise prototypes or pilots at a meaningful scale, a substantial part of the funding is expected to come from third parties.

Projects will actively contribute to the implementation of the Roadmap and Implementation Plan of the CCS Industrial Initiative of the SET-Plan, and should, whenever relevant, contribute to the monitoring and knowledge sharing schemes of the Initiative.

The European Commission reserves its right to ask the project, during the negotiation, to establish strong links, where appropriate, with relevant R&D projects at EU, national or regional level.

Topic ENERGY.2013.5.1-2: New generation high-efficiency capture processes

Content/scope: The objective is to support the development of high-potential novel technologies or processes for post- and/or pre-combustion CO₂ capture. Research should follow new paths leading to highly innovative technologies and materials for CO₂ capture applications with the potential for real breakthroughs. This could include systems based on solids or liquids or a combination of these such as enzyme based systems, bio mimicking systems or advanced solid sorbents and membranes. Environmentally benign technologies

should be pursued. Projects shall provide "proof of concept" through prototype testing. Any research that constitutes a technology demonstration at large scale or a combination of existing CCS technologies will not be considered for funding.

Funding scheme: Collaborative Project

Expected impact: Progress in this area should result in a significant reduction of the energy penalty of the whole capture process for power plants or other energy-intensive industries, and/or in a substantial decrease of the cost of capture.

Additional Information: With a view to promoting international cooperation with Australia, initiatives for collaboration between project(s) under this topic and selected Australian project(s) will be encouraged on the basis of mutual benefit and reciprocity. The Commission reserves the right to ask the coordinators of FP7 projects, during the contract negotiations, to include collaboration activities (e.g. exchange of information, exchange of researchers) with selected Australian project(s) that are financed by the Australian Department for Resources, Energy and Tourism (DRET) and the Department of Industry, Innovation, Science, Research and Tertiary Education (IISRTE).

The participation of innovative SMEs is particularly encouraged.

Projects will actively contribute to the implementation of the Roadmap and Implementation Plan of the CCS Industrial Initiative of the SET-Plan, and should, whenever relevant, contribute to the monitoring and knowledge sharing schemes of the Initiative.

II.5.2. Area Energy.5.2: CO₂ Storage

Topic ENERGY.2013.5.2.1: Mitigation and remediation of leakage from geological storage

Content/scope: Geological storage of CO₂ often meets with public opposition. This opposition is mainly due to a negative perception of safety, reliability and controllability of the storage process, and concerns for leakage of CO₂ - with human health and/or environmental impacts. Safe, long-term geological storage - both onshore and offshore - therefore brings the need for sophisticated methods for the detection, characterisation, mitigation and remediation of leakage from CO₂ storage sites.

Mitigation and remediation options should be investigated for a number of different leakage scenarios, addressing for example impaired caprock (dissolution, faults/fractures), well integrity, spillpoint outflow, secondary CO₂ accumulations in shallow aquifers or soils, and eventually surface release. Research should include a thorough analysis of the mechanisms controlling the migration of CO₂ out of the storage target. Results from the project - mitigation and remediation methodologies - shall be published as guidelines which can feed into the regulatory process for storage permitting, in particular into the corrective measures plan for storage site operators pursuant to the Directive on geological storage.

Funding scheme: Collaborative Project

Expected impact: Projects should provide a technical knowledge base for the definition of protocols and safety regulations.

Additional information: Inclusion of industrial partners active in CO₂ storage could lead to increased impact of the research to be undertaken. This will be considered during the evaluation under the 'Impact' criterion.

Projects will actively contribute to the implementation of the Roadmap and Implementation Plan of the CCS Industrial Initiative of the SET-Plan, and should, whenever relevant, contribute to the monitoring and knowledge sharing schemes of the Initiative.

The European Commission reserves its right to ask the project, during the negotiation, to establish strong links, where appropriate, with relevant R&D projects at EU, national or regional level.

I.6. Activity Energy.6: Clean Coal Technologies

Research, development and demonstration of technologies to substantially improve efficiency, reliability and cost of coal (and other solid hydrocarbons) fired power plants. This can also include the production of secondary energy carriers (including hydrogen) and liquid or gaseous fuels. 'Clean coal' in this context really means a sustainable solid hydrocarbon value chain with a focus on efficient and clean coal utilization, i.e. coal use aiming at zero or significantly reduced emissions by means of enhanced plant efficiency and CO₂ capture and storage.

II.6.1. Area Energy.6.1: Conversion Technologies for Zero Emission Power Generation

No topics are opened in this area.

II.6.2. Area Energy.6.2: Coal-Based Poly-Generation

No topics are opened in this area.

II.5.&6. Cross-Cutting Actions between Activities Energy.5 and Energy.6

This section includes areas and topics that are cross cutting between 'CO2 capture and storage for zero emission power generation' and 'clean coal technologies', which in many ways are complementary activities.

II.5&6.1. Area Energy.5&6.1: Power Generation Technologies for Integrated Zero Emission Solutions

No topics are opened in this area.

II.5&6.2. Area Energy.5&6.2: Cross Cutting and Regulatory Issues

No topics are opened in this area.

I.7. Activity Energy.7: Smart Energy Networks

To facilitate the transition to a more sustainable energy system, a wide-ranging R&D effort is required to increase the efficiency, flexibility, safety, reliability and quality of the European electricity and gas systems and networks notably within the context of a more integrated European energy market.

II.7.1. Area Energy.7.1: Development of Inter-Active Distribution Energy Networks

Topic ENERGY.2013.7.1.1: Development of methods and tools for network integration of distributed renewable resources

Contents/scope: The aim is to develop methodologies and tools to enable DSOs to take on new roles and evolve existing roles required by the increased number and volume of distributed energy resources connected to distribution networks. An important new role is observing and balancing of variable renewable generation and loads with decentralized flexible generation, active demand and local storage. It may also require congestion management and the provision of ancillary services. Network operations and grid maintenance will need to be upgraded. Further roles include short- and long-term forecasting and long-term planning. The methods and tools should have a wide applicability in European contexts.

These roles and methods need to be developed in cooperation with TSOs where responsibilities need to be shared. New methods and tools also need to facilitate new roles of market players and to create a level playing field. For example, in the case of ancillary services, the architecture of an efficient marketplace for ancillary services at the distribution level should be developed, and DSO's should be enabled to provide ancillary services to support TSO operations.

The projects should address resources from small to medium-scale residential, industrial and commercial "prosumers". To further support innovation in business models the projects should take into account contributions from new actors such as aggregators. Validation of the approaches and tools should be performed through simulation and demonstrations. The demonstrations should contribute to the EEGI implementation. Strong links should be created with planned or ongoing R&D, demonstration and deployment projects in different settings in Europe to form a family of projects. The projects should contribute to the monitoring and knowledge sharing schemes of the EEGI.

Projects should include substantial participation of major players such as network operators, power or ICT technology providers, research centres or universities. Projects should include committed participation of distribution operators and also of transmission operators and market players where appropriate. The participation of market players should be consistent with unbundling principles

Funding scheme: Collaborative Project

Expected impact: The projects should contribute to increasing the capacity of medium and low-voltage networks to host renewable and distributed energy resources with a trade-off of grid reinforcement and grid intelligence, without jeopardising quality of service. It should ensure a cost-effective long-term evolution of electricity networks, while connecting new

generation to new loads.

Additional information:

Each proposal does not need to cover all the aspects of the entire topic.

II.7.2. Area Energy.7.2: Pan-European Energy Networks

Topic ENERGY.2013.7.2.1: Advanced concepts for reliability assessment of the pan-European transmission network

Contents/scope: Today's network reliability is guaranteed by the (n-1) rule, which assures continuity of the electricity supply in case of loss of a single critical component, without instability or cascading issues. With the massive introduction of renewable energy sources (RES), a continuum of intermediate situations from full production to zero production is possible for numerous specific components of the network. As a consequence, the network reliability assessment and subsequent contingency measures need to be step-changed to face the challenges of a complex and multi variable system, where the (n-1) rule is not any longer sufficient.

The aim of this topic is to identify, develop, assess and recommend innovative strategies, methods and tools to evolve current security criteria for the future pan-European electricity transmission system while maintaining present-day reliability levels. The new security criteria should consider the substantial anticipated changes in the energy mix for future generation scenarios and recommend ways to allow a smooth transition. Pilot testing of the proposed concepts in a part of the European electricity network should be included.

The consortium should include a relevant number of TSO's.

Funding scheme: Collaborative Project

Expected impact: In the future network, with growing amounts of RES, Transmission System Operators should be able to maintain the high level security of energy supply today based on the practice of the (n-1) rule, thus allowing a high degree of integration of renewable sources at no expense of quality of energy supply. The results of the studies and the tests conducted in this topic will provide valuable knowledge for broader application at EU level and for strengthening pan-European overall system reliability.

Topic ENERGY.2013.7.2.2: Large-scale demonstration of innovative transmission system integration and operation solutions for (inter)connecting renewable electricity production.

Contents/scope: This topic primarily addresses important technological challenges stemming from the large-scale penetration of renewable electricity production in the European transmission network, in particular (i) the need to connect foreseen substantial renewable electricity production (including cross-national generation projects) far from consumption centres (e.g. off-shore wind); (ii) the need to manage the time shift between production and consumption, possibly combined with (iii) the need for increased electricity transmission between EU Member States.

Operationalisation and integration of storage systems will be part of technological solutions to address the mentioned challenges.

The projects will propose innovative technological solutions that will be implemented on one or several demonstration sites and can cover one or more of the following areas:

- innovative technologies for new and more powerful interconnection of electricity networks;
- first-of-a-kind application of new DC technologies (e.g. HVDC, DC breakers, DC/DC converters), including processes for ensuring HVDC grid security;
- reliable and cost-efficient multi-connector technology for multi-terminal grid solutions;
- combined solutions for interconnection and renewables integration;
- integration of large scale storage in inter-connected networks;
- optimised technologies for connecting offshore wind farms to offshore transmission lines, which also interconnect two countries (both HVDC / HVAC), including control and protection methods and possibly alternative solutions for power collection systems in offshore wind farms.

In view of the replication of the demonstrated solutions and their future commercial exploitation, the technical work in the demonstration projects should be accompanied by activities that propose practical ways to deal with the possible economic, regulatory, institutional and social constraints and barriers that projects deploying the innovative technologies could face (including contribution to standardisation).

The project should propose Key Performance Indicators to define the objectives of the project (reference and targets).

Funding scheme: Collaborative Project with a predominant demonstration component

Expected impact: These activities will contribute insights and strategies for securing the EU market for innovative transmission technologies towards 2020 and beyond and will result in policy recommendations. The projects will actively contribute to the technological objectives of the Roadmap and Implementation Plan of the EEGI and activity strand 3 of the European Wind Initiative (wind-grid integration).

The proposals will have to support the European priority projects for electricity infrastructure as defined in the frame of the new EU Infrastructure Policy.

Additional information: The leading role of relevant industrial partners is essential to achieve the full impact of the projects submitted, inter alia: TSOs and technology providers (electrical equipment, cable technology, ICT ...) and utilities/renewable electricity producers (especially wind).

The topic aims to facilitate the implementation of the SET-Plan European Electricity Grid Initiative (EEGI). The European Commission reserves its right to ask the projects during the negotiation, to establish strong links, where appropriate, with relevant R&D projects at EU, national level.

Topic ENERGY.2013.7.2.3: Ensuring stakeholder support for future grid infrastructures

Contents/scope: The Project should take a society-oriented path, analysing major stakeholder concerns to the deployment of new or upgraded grid infrastructure and developing approaches to proactively engage stakeholders in the permitting process. The approach should as far as

possible build on transparency, dialog with stakeholders, benefit sharing and other relevant measures. It should be informed by analysis of public concerns in a representative set of Member States. The approach should be supported by the implementation of practical measures to build stakeholder support and be reinforced by replication strategies based on best practice.

The work should take stock and build on relevant experiences of public acceptance of large energy infrastructures, such as wind turbines.

Funding scheme: Collaborative Project

Expected impact: The project should contribute to facilitating and accelerating the deployment of new grid infrastructure in the EU by addressing the issue of public acceptance, which is seen as an important show stopper. Projects are expected to contribute to the permit granting and public participation measures expected to be implemented through the proposed regulation on guidelines for trans-European energy infrastructure.

Additional information: The project(s) should contribute to the monitoring and knowledge sharing schemes of the EEGI.

Up to one project might be funded.

II.7.3. Area Energy 7.3: Cross Cutting Issues and Technologies

Topic ENERGY.2013.7.3.1: Planning rules for linking electric vehicles (EV) to distributed energy resources

Contents/scope: The aim is to develop network planning rules and tools to enable electric vehicles in a large scale roll out to link with distributed energy resources. The project should provide methods to deal with specific infrastructure characteristics, and local load and congestion issues. Furthermore, it should propose cost effective solutions and investment strategies. The work should take due account of the particular load characteristics and the level of intelligence for a broad range of charging scenarios for electric vehicles. The project should relate to network planning activities from a representative set of distribution networks in Europe and include competence on Low Voltage / Medium Voltage grid simulation and support from automotive manufacturers.

Expected Impact: The project should improve the distribution networks hosting capacity of EV and Distributed Energy Resources (DER). It should enable Distribution System Operators (DSOs) in Europe to do more efficient and more cost effective network planning. Furthermore the project should enable intelligent charging of a variety of EV and promote harmonised conditions in the roll out of charging infrastructure.

Funding scheme: Collaborative Project

Additional information: The project should contribute to the monitoring and knowledge sharing schemes of the EEGI.

Up to one project might be funded.

Topic ENERGY.2013.7.3.2: Enhanced interoperability and conformance testing methods for interaction between grid infrastructure and EVs

Contents/scope: The aim is to develop enhanced and innovative conformance testing methods for the interaction between grid infrastructure and EVs. It includes development of a proposal for a European smart grid reference system to enable the verification of interoperability through efficient tests. The work should comply with draft standards developed under M/468 and M/490. It should furthermore ensure a strong link to international standardization and be open to cooperation with US stakeholders to promote cross certification wherever relevant.

Expected Impact: The project should provide manufacturers of EV and EV infrastructure with cost effective conformance testing methods for their products interaction with the European electricity network. Furthermore it should enable EV users to verify their expectations to pan-European interoperability of charging services.

Funding scheme: Collaborative Project

Additional information: The project should contribute to the monitoring and knowledge sharing schemes of the EEGI.

Up to one project might be funded.

I.8. Activity Energy.8: Energy Efficiency and Savings

The vast potential for final and primary energy consumption savings and improvements in energy efficiency need to be harnessed through the research into, optimisation, validation and demonstration of new concepts, optimisation of proved and new concepts and technologies for buildings, transport, services, and industry. Large-scale actions may be supported by innovative R&D addressing specific components or technologies. A key aim is the optimisation of the local community energy system, balancing a significant reduction in energy demand with the most affordable and sustainable supply solution, including the use of new fuels in dedicated fleets.

II.8.1. Area Energy.8.1: Efficient Energy Use in the Manufacturing Industry and Building Sector

No topics are opened in this area.

II.8.2. Area Energy.8.2: High Efficiency Poly-Generation

No topics are opened in this area.

II.8.3. Area Energy.8.3: Large-Scale Integration of Renewable Energy Supply and Energy Efficiency in Buildings: ECO-BUILDINGS

No topics are opened in this area.

II.8.4. Area Energy.8.4: Innovative Integration of Renewable Energy Supply and Energy Efficiency in Large Communities: CONCERTO

No topics are opened in this area.

II.8.5. Area Energy.8.5: Innovative Strategies for Clean Urban Transport: CIVITAS-PLUS

No topics are opened in this area.

II.8.6. Area Energy.8.6: Socio-Economic Research and Innovation

No topics are opened in this area.

II.8.7. Area Energy.8.7: Thematic Promotion and Dissemination

No topics are opened in this area.

II.8.8. Area Energy.8.8: Smart Cities and Communities

Urban communities often share residential, public or commercial spaces that lend themselves to the early adoption of innovative energy technologies along with information management systems that can dramatically **reduce energy consumption** through efficiency savings. Smart cities and communities are those that integrate ICT and social and environmental capital to provide more efficient, new or enhanced services to citizens, especially in the energy and transport fields. They will start to link together new technologies for the provision of services – such as heat, mobility, light, communications and other utilities – in intelligent and evolving networks that can facilitate an urban energy revolution supported by data management.

In the framework of this initiative, industry is invited to take the lead in collaboration with cities devise innovative measures that accelerate the deployment of low carbon technologies. The initiative encompasses, in an integrated way, a broad range of energy related topics such as urban planning, energy efficiency, energy (electricity and heating & cooling) networks, flows and renewable energy production as well as other urban issues in the area of ICT and transport.

The Smart Cities and Communities Initiative intends to promote replication of successful solutions through clustering of cities with similar framework conditions and similar ambitions. To enhance this replication potential, ensure an EU-wide impact of the measures and to facilitate the exchange of knowledge, cities from at least three Member States and/or Associated Countries and industrial partners are expected to team up for a project proposal. Financial support will be given to measures proposed in these topics on the basis that such measures would help cities to substantially reduce greenhouse gas emissions in an innovative and integrative manner and represent a high replication potential.

Topic ENERGY.2013.8.8.1: Demonstration of optimised energy systems for high performance-energy districts

Contents/scope: The objective of this topic is to demonstrate, at the level of cities or districts, an innovative integrated energy system, optimised both in terms of increase in energy efficiency and CO₂ reduction.

This objective may be achieved with a balance of supply-side measures based on a high share of renewables and demand-side measures to reduce consumption. Although the balance shall be optimised for each city, it should lead to a good business case for replication.

The proposals should address at least two of the three following aspects, through a credible and coherent integrated approach. However, it would be a substantial added value for a proposal to successfully cover all three aspects of the topic. This will be considered during the evaluation under the "Scientific and Technological quality" criterion.

1. **Retrofitting of a district of existing buildings.** The proposed measures can address all types of buildings, with a focus on residential and public buildings.⁴ All elements and systems of the buildings that could in a life-cycle perspective (thus including embedded energy) contribute to a better energy efficiency and sustainability through integrated design and planning should be envisaged, the measures shall be chosen based on a sound assessment of the economic and environmental performances of the different technology options. The detailed metering/monitoring programme should last at least for one full year, however, longer term commitment and programmes of the building operators (e.g. in continuous monitoring and/or guarantees of performance to the tenants) would give an added value to the proposal.
2. **Proposing innovative solutions for the electricity distribution grid,** with the objective to improve the integration of a large share of power generated from renewable energy sources. The electricity to be supplied to the grid at city level should stem from a large single supply spot (for example a Combined Heat and Power plant) and from distributed electricity sources (for example photovoltaic installations). These innovative solutions should make the best use of power electronics, and consider electricity storage devices or mechanisms to match supply and demand. The proposals should analyse the technical and economic optimum of storage and photovoltaic plants at district level, at individual house levels or a mix of both approaches. In addition, they can cover technological and economic assessment of the integration of electric vehicles into the local grid, with intelligent charging/discharging systems and assessment of the best balance of stationary versus mobile storage.
3. **Proposing innovative solutions for district heating and cooling energy supply,** with the objective of improving the overall efficiency of the system (heat generation, distribution and final use). The applicants should propose district heating systems based primarily on recovering waste heat and adapting the temperature levels of the grid to the applications. In doing so, the proposals could envisage links with industrial parks. The proposals should consider innovative applications for hot water, such as white goods supply. It should also make the best use of heat or cold storage devices or systems.

The activities proposed by the applicants should be based on a convincing city and mobility planning exercise with special consideration of innovative energy technology integration and participation of all relevant actors, completed at an earlier stage. Costs related to this planning exercise are not in the scope of this topic. All proposals should present a sound business model of all measures envisaged to be carried out in the project. This model should pay particular attention to assess economics and benefits for industry and the customers and end-users. The proposals will be asked to report performance data into existing platforms for best-practice sharing such as CONCERTO and the Smart Cities Stakeholder Platform. Thus, they should allocate appropriate resources for ambitious reporting and innovative dissemination measures.

Expected Impact: The successful projects should set-up clusters of cities and partnerships between cities and industries, while integrating actions and demonstrate their viability as new innovative market solutions. In this respect, the proposals should show a high replication potential contributing to large scale market deployment before 2020. An ambitious dissemination and market deployment plan should be included in the proposal. The credibility of this replication plan will be part of the evaluation.

Further expected impacts are mentioned at the area level.

⁴ In support of the proposed European directive on energy efficiency.

Funding scheme: Collaborative Project with a predominant demonstration component

Additional information: The grant will always be composed of a combination of: the typical reimbursement of eligible costs, and flat rate financing determined on the basis of scale of unit costs only for the building-related demonstration activities part of the buildings.

For the buildings refurbishment aspects only: the scale of unit cost for European Union financial contribution is fixed at EUR 100 /m² eligible costs and thus EUR 50 /m² European Union contribution. The amounts determined on the basis of the scale of unit costs are reimbursed by applying the upper funding limits specified in Article II.16 of the model grant agreement. Therefore, the reimbursement rate will be up to 50%, i.e. EUR 50/m². The eligible costs per m² for the building demonstrated in the project(s) are fixed costs. The total of European Union financial contribution based on scale of unit costs may not exceed EUR 15 million per project. The evaluation of the proposals will also take into account under the "S&T excellence" criterion the degree of excellence and innovation of the technology used, the level of projects ambition and the most cost effectiveness of the practices to be demonstrated (euros/efficiency gain; euros/CO₂ reduction, kWh/m²/year saved). For this reason, the above figures should be indicated in the proposal.

This action supports the implementation of the Smart Cities and Communities Initiative of the SET-Plan. The European Commission reserves its right to ask the project, during the negotiation, to establish strong links, where appropriate, with relevant R&D projects at EU, national or regional level.

I.9. Activity Energy.9: Knowledge for Energy Policy Making

Development of tools, methods and models to assess the main economic and social issues related to energy technologies. Activities will include the building of databases and scenarios for an enlarged EU and the assessment of the impact of energy and energy-related policies on security of supply, environment, society, competitiveness of the energy industry and issues of public acceptability. Of particular importance is the impact of technological progress on EU policies. Activities will include scientific support for policy development.

II.9.1. Area Energy.9.1: Knowledge Tools for Energy-Related Policy Making

Topic ENERGY.2013.9.1.1: Modelling innovation policies for the decarbonisation of the energy system

Content/scope: Without a technological shift in our current energy system, the EU will not achieve all of the 2020 targets, and will fail on its 2050 ambitions to largely decarbonise energy and transport sectors. To be successful, Europe needs to mobilise policy resources both deployment and technology push in a comprehensive way to create the adequate regulatory and market framework and to make the necessary investments in research and innovation that will bring new, high performance technologies to mass markets. Much depends on the acceleration of technological development and deployment. It is uncertain which technological options might develop, at what pace, how the market will evolve, which policies are needed with what consequences and trade-offs.

In the context of the European Strategic Energy Technology Plan (SET-Plan), the objective of this topic is to develop tools that model the effects of technology push and demand-side innovation policies and instruments on the development and deployment of low carbon energy technology and solutions up to 2050. Such tools should be able to compute long-range scenarios of the complete energy sector and its technology mix at a disaggregated level and to quantify how policies and innovation efforts can shape the pace and structure of their development, deployment and financing. Although supply and demand side instruments differ in their efficiency properties, they are, at least to some degree, substitutable and complementary to each other. Hence the tools shall be able to quantify their respective effectiveness in terms of market developments, cost-effectiveness, leverage of resources and policy goals and the effectiveness when used in synergy. They shall enable pro-active analysis of existing and proposed policies and investments both public and private related to low carbon energy solutions at EU and MS level. The results shall be tailored as to inform technology, program, policy, and market decisions as low carbon technologies advance from concept to commercial application.

Transparency of the tools and data is a mandatory.

Funding Scheme: Collaborative Project

Expected Impact: Better understanding of the impacts of innovation policies on the transition to a low carbon energy system. Availability of appropriate techniques and tools to provide greater confidence with regard to suitable transition strategies and assist policy makers in making complex and far reaching decisions on a rational basis.

Additional Information: up to one Collaborative project may be funded. A multi-disciplinary approach is encouraged. A policy on 'open access' to tools and data for the common good

should be established. In particular, this activity should interact with the Information System for the European Strategic Energy Technology Plan (SET-Plan) operated by the Joint Research Centre of the European Commission (JRC). The active participation of relevant partners from neighbouring third countries could add to the scientific and/or technological quality of the project and/or lead to an increased impact of the work to be undertaken.

II.9.2. Area Energy.9.2: Scientific Support to Policy

Topic ENERGY.2013.9.2.1: European scientific multidisciplinary "think-tank" to support energy policy and to assess the potential impacts of its measures.

Content/scope: The energy and climate change policy brings many new intellectual challenges, in particular, the need to develop a multidisciplinary approach to issues that are increasingly interconnected. For instance, to achieve the 20% renewables target entirely new approaches and a paradigm shift on the energy system will be needed. Environmental, economic, technical, trade and legal issues need to be addressed urgently. Similarly new multidisciplinary approaches will be needed regarding energy efficiency, the Internal Energy Market, and oil and gas security stock, but to name a few, are needed.

The 'think tank' will contribute to and enhance the European Union's ability to properly develop these issues in terms of policy research. It should bring together Europe's foremost energy, economic, legal, trade and engineering academics and experts from industry, to support the rapid development of Community policy by providing input to the assessment of potential impacts of policy alternatives and options. The 'think tank' will cooperate with the EU's Joint Research Centre. The 'think tank' will work on the basis of an annual work plan that anticipates and corresponds with the policy agenda; it could be supported by a network of energy policy research organisations that will analyse the issues in hand, prepare for and stimulate the debate of the 'think tank' and thus enable for and facilitate its ideas and perspectives. It would select a few topics for which it will deliver a 'think tank' report, analysing policy alternatives, against a predefined set of criteria, that in every case will include at least sustainability, security of supply and competitiveness. The 'think tank' may expand its consultation basis via internet to a broader community.

The topics should be developed in the context of the European Strategic Energy Technology Plan (SET plan). The Think Tank will also consider input from other advisory groups (e.g. Advisory Group on Energy) for technological issues

Funding scheme: Coordination and support action (supporting)

Expected impact: To improve the knowledge support to policy making and assessing policy options.

Additional information: Consortium composition could include universities, research centres and industry representative organisations. The project duration shall not exceed 36 months, with a maximum EU contribution requested of EUR 2 000 000. Due to the nature of the activities to be carried out, a single project might be funded under this topic.

I.10. Activity Energy.10: Horizontal Programme Actions

The topics described in the section have a horizontal character not linked specifically to any particular technology.

II.10.1. Area 10.1: ERA-NET and support to Joint Programming

Topic ENERGY.2013.10.1.1: ERA-NET Plus – Bioenergy: Demonstrations of the European Industrial Bioenergy Initiative

Open in call: FP7-ERANET-2013-RTD

Content/Scope: The aim of this ERA-NET Plus is to continue to promote joint strategic planning and programming for the implementation of Bioenergy demonstration projects, in accordance with the priorities set out in the SET-Plan European Industrial Bioenergy Initiative (EIBI), as derived from the corresponding Implementation Plan⁵. It will involve the launch of a single joint call for proposals by the promoters of national and/or regional programmes, thereby allowing a more efficient use of existing financial resources and promoting knowledge sharing.

Demonstration plants are considered the last non-economic step to demonstrate the performance and reliability of all critical steps in a value chain, so that the first commercial unit can be designed and its performance thoroughly assessed from the outcome of the demo unit.

Funding scheme: Coordination and Support Action (coordination)

Expected impact: This ERA-NET Plus will contribute to reach the objectives of the EIBI as far as demonstration projects are concerned, i.e. it will contribute to accelerate the development and deployment of the concerned Bioenergy technologies through an enhanced and effective cooperation between the various stakeholders at European level.

Additional information: For further details concerning the implementation of the ERA-NET and ERA-NET Plus calls see Annex 4 of the Cooperation work programme.

N.B. This topic is conditional on the success of the currently open topic for an ERA-NET Plus and on the willingness of the Member States to continue with the joint programming.

Topic ENERGY.2013.10.1.2: ERA-NET Plus – European wind resources assessment

Contents/scope: The aim of this ERA-NET Plus is to provide the wind energy sector with more detailed resource mapping, through the creation and publication of a new EU wind atlas based on the development of improved models for wind energy physics. It will also include a wind climate database. The atlas will cover all EU Member States as well as Member States' exclusive economic zones, both onshore and offshore.

It will involve the launch of a single joint call for proposals by the promoters of national

⁵http://setis.ec.europa.eu/activities/implementation-plans/European%20Industrial%20Bioenergy%20Initiative_-EIBI.pdf

and/or regional programmes, thereby allowing a more efficient use of existing financial resources.

The call for proposals will address:

- The development of new/more advanced models for assessing wind resources for wind farm development, wind turbine design, spatial planning, policy promotion, and other uses. This should involve the development of dynamical downscaling methodologies and open-source models, validated through measurement campaigns, to enable the provision of accurate wind resource and external wind load climatology and short term prediction at high spatial resolution. The developed downscaling methodologies and models will be fully documented and made publicly available. It will be used to produce overview maps of wind resources and other relevant data at several heights and at horizontal resolution down to 100 meter covering EU Member States and their exclusive economic zones. The dynamical models will be improved at various scales as well as their coupling (model chain). Uncertainty estimates for models and model chains will also be published. Analysis will be performed for short term forecasting predictability.
- The validation of the models through measurement: Measurements campaigns should be coordinated and cover at least complex terrains (mountains and forests), offshore, large changes in surface characteristics (roughness change) and cold and rough climates. Campaigns will include remote sensing and advanced sensors.
- The creation of an electronic European wind atlas: The European wind atlas will include the underlying data and a new EU wind climate database. It will provide the hourly variables at each grid point, with accuracy over 10%, together with elevation and other boundary data at a horizontal resolution of 1 - 5 km. Further to this, the atlas should become a useful spatial planning tool for public authorities and decision-makers. The EU climate database will include all possible air mass dynamics. Guidelines and best practices for the use of data, such as extremes and turbulence (especially relevant for micro siting) will be developed.

Funding scheme: Coordination and Support Action (coordination)

Expected impact:

This project should contribute to:

- Reduce the uncertainties and risks related to the design and operation of large-scale wind turbines through an enhanced knowledge of wind energy physics, creation of a standard for site assessment.
- Better quantify European wind energy potential, and provide data and models (e.g. for short term prediction) that can improve spatial planning tools and help improve operations and ensure an effective and efficient deployment of wind power.

Additional information: An additional work package may envisage the international cooperation. In particular, synergies could be foreseen with the European Space Agency (ESA), the European Environment Agency (EEA), and the International Renewable Energy Agency (IRENA). Potential users of the new EU Wind Atlas should also be involved. The project should include a coordination work package to establish a link with relevant national initiatives.

A specific monitoring and knowledge sharing mechanism will be established in coordination with the European Commission.

Topic ENERGY.2013.10.1.3: Supporting the coordination of national research activities of Member States and Associated States in the field of OCEAN energy (ERA-NET)

Open in call: FP7-ERANET-2013-RTD

Content/scope: The objective of the ERA-NET scheme is to step up the cooperation and coordination of research programmes in the field of ocean energy at national level in the Member or Associated States through the networking of organisations involved in the support to Ocean Energy research and development. This is aimed at the development and implementation of joint programming and opening of calls.

Proposed coordination activities: This ERA-NET is expected to build upon and draw lessons from the various experiences gathered and work done in the framework of ocean energy in Europe, in order to identify the most relevant research activities to be undertaken beyond the national level. Coordination activities will therefore encompass all the steps of an ERA-NET (Information exchange, definition, preparation and implementation of research activities funding of joint trans-national research actions). This ERA-NET is expected to implement at least 1 joint call per year.

Funding scheme: Coordination and Support Action (coordinating action)

Additional eligibility criteria: As for other ERA-NET actions, this topic is mainly addressed to bodies managing or financing national research and innovation programmes, and not for research performers. A complete description of the eligibility criteria is provided in Annex IV of this work programme.

Expected impact: Ocean energy R,D&D activities are carried out separately in several Member States. The coordination offered by this ERA-NET will enhance synergies and raise the scattered profile of a sector having difficulties to build a mature industrial and commercial status.

Support to joint programmes between research performers on innovative research in support of the SET Plan Research and Innovation Agenda

Context/scope: The transition to a sustainable European energy system will require a continuous flow of research inputs to develop new low-carbon energy technologies and solutions, to reduce their cost and time to market and to enable their continuous improvement over the next decades.

This topic participates in the implementation of the Strategic Energy Technology (SET) Plan, the EU strategy to accelerate the development and market roll-out of low carbon energy technologies. The objective is to support joint programmes of several research performers from different Member States, Associated Countries and other third countries when appropriate to advance the longer term research agenda of the SET Plan roadmaps⁶ in the fields of solar photovoltaic, wind energy, smart grids, energy storage and bio-energy. Each Joint Programme shall be focused on one technology area previously mentioned. Up to one Joint Programme per technology area is expected to be funded.

⁶ Commission staff working document "A technology roadmap" [SEC(2009)1295] and Commission staff working document "Materials Roadmap Enabling Low Carbon Energy Technologies" [SEC(2011)1609]

The aim of a Joint Programme is to bring together and integrate, on a European Scale, programmes of research performers, in order to promote joint research activities on critical areas of European interest. A Joint Programme targets research programmes of institutions, rather than individual researchers and projects. It shall result in a high level of integration between the different research programmes involved. A Joint Programme shall clearly show and justify its European Added Value compared to efforts undertaken at national level. The Joint Programme shall combine, in a closely co-ordinated manner:

- (i) Networking activities, to foster a culture of co-operation between research organisations and scientific communities and help developing a more efficient and attractive European Research Area;
- (ii) Exchange of researchers to support scientific communities in their access to the identified research programmes;
- (iii) Joint research activities, to improve, in quality and/or quantity, the services provided by the programmes. The research shall be innovative and generate new knowledge and technologies/proof of concepts aimed at accelerating the translation of discovery-oriented scientific research into technological and providing solutions to technical showstoppers faced by industry in a timely and seamless manner.

The core of the proposal should be centred on joint research activities. However, the proposal could combine all three categories of activities as synergistic effects are expected from these different components.

Consortia could include actions on international cooperation. In line with the political context set out by Innovation Union a specific activity on innovation is requested to increase the potential for innovation. This activity would cover activities to reinforce the partnership with industry in the context of the SET Plan European Industrial Initiatives, e.g. transfer of knowledge and other dissemination activities, activities to foster the use of research outcomes and infrastructures by industry.

Implementation and management: Support to a Joint Programme will be given for an initial duration of 4 years. The consortia shall detail the research competencies and infrastructure available within the joint programme to implement all three categories of activities. On this basis, for all three categories of activities the consortia shall describe precise deliverables and Key Performance Indicators as well as a detailed management and resource (funding and human resources) plans for this initial period of four years. It is not expected that the joint research activities for this initial 4 year period will cover all the research needs of the technology area selected. Therefore proposals shall be focused on research areas for which concrete progress can be made within the four year period. Proposals shall nonetheless include a long term work plan covering more research needs of the selected technology area and describing the capacity of the consortium and its development plan to address them in the future, notably in view of bridging to Horizon 2020, the next Framework Programme for Research and Innovation. The bulk of the EU contribution will be allocated to the Joint research activities. A letter of endorsement of the research institutions underpinning the Joint Programme shall be provided in the proposal.

Funding Scheme: Collaborative Project

Expected Impact: Joint Programmes are expected to reinforce the European Research Excellence in energy technology research by bringing a European coherence among national research operators through the pooling of research capacities and by addressing high risk, high cost, and long-term research for which there is a lack of critical mass at MS level, strong potential for economies of scale and a high demand for cutting-edge research capacities.

Performers of research programmes will develop synergies and complementary capabilities in such a way as to optimise the development, use and sustainable operation of the joint research programmes and to offer an improved access to researchers. Joint Programmes should also contribute to increase the potential for innovation of the related research programmes, in particular by reinforcing the partnership with industry, through e.g. transfer of knowledge and other dissemination activities, activities to foster the use of research outcomes by industry.

Additional information: Up to one Joint Programme per technology area is expected to be funded. In the framework of the SET Plan a specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and its Information System of the SET Plan (SETIS) and the selected Joint Programmes will be requested to participate. Also, the Commission will ensure proper linking, where appropriate, between these Joint Programmes, as well as with other relevant SET Plan initiatives

Topics opened:

Topic ENERGY.2013.10.1.4: Joint programme in the field of photovoltaics

The joint programme supported under this topic should contribute to the medium to long term objectives of the SET Plan for photovoltaics, anticipating the long term perspective of the European Solar Industrial Initiative. It aims at preparing the next wave of industrial demonstration and deployment of photovoltaic technologies. In the two established solar cell technologies, i.e. crystalline Si and thin films, highly research-intensive drivers to pursue are the enhancement of performance at cell and module level as well as the development of low-cost, high-throughput manufacturing processes. Bottlenecks hampering the take-off of emerging technologies (e.g., organic cells) should also be addressed. In the medium/long term, these technologies could offer the advantage of very low cost active materials, low-cost substrates, low energy input, and easy upscaling.

Topic ENERGY.2013.10.1.5: Joint programme in the field of wind energy

The joint programme supported under this topic aims at preparing the next wave of industrial demonstration and deployment of wind energy technologies, especially in the offshore environment. A key objective will be to address the research challenges of the SET-Plan European Wind Industrial Initiative in a common and structured way at European level. The medium to long term research undertaken under the programme is expected to accelerate the development of efficient and cost-effective large offshore wind turbines, including their substructures and the large scale grid integration of wind energy.

Topic ENERGY.2013.10.1.6: Joint programme in the field of bioenergy

The joint programme(s) developed under this topic should contribute to the medium to long term objectives of the SET Plan for bio-energy, anticipating the long term perspective of the European Industrial Bioenergy Initiative (EIBI). It aims at preparing for the next wave of industrial demonstrations and deployment of bioenergy technologies. It will support R&D avenues leading to the most advanced, innovative and groundbreaking bioenergy pathways, also taking into account the requirements in terms of sustainability, cost effectiveness and of the users.

Topic ENERGY.2013.10.1.7: Joint programme on smart grids

The joint programme should contribute to the medium to long term objectives of the SET Plan for Smart Grids, anticipating the long term perspective of the European Electricity Grid Initiative (EEGI); the joint program may include aspects from the Smart Grids European Technology Platform Strategic Research Agenda for 2035 and aspects from the Materials Roadmap Enabling Low Carbon Energy Technologies SEC (2011) 1609.

Topic ENERGY.2013.10.1.8: Joint Programme on electrochemical storage

Energy Storage has been identified as a critical technology for the transition to and operation of a more sustainable and low carbon European energy system. The joint programme should address the critical shortcomings of existing grid-scale technologies by developing new electrochemical paths and proof-of-concept for emerging storage-component technologies. Activities should focus on proposing and developing novel and innovative designs for stationary batteries and other electrochemical devices to be used in grid-scale energy storage applications. Proposers should consider the results of document SEC (2011) 1609 – Materials Roadmap Enabling Low Carbon Energy Technologies.

II.10.2. Area Energy.10.2 Other Horizontal Actions

Topic ENERGY.2013.10.2.1: Understanding interfaces in rechargeable batteries and super-capacitors through in situ methods

Content/scope: The understanding and control of interfaces in rechargeable batteries and super-capacitors is essential to ensure good electronic and ionic transport across them. The term "interface" does not only refer to solid electrode/liquid electrolyte interface but also to buried interfaces (e.g. between additives and active material, the solid electrolyte interphase, and between lithiated and delithiated phases (in lithium ion batteries), etc. The physical and chemical processes occurring at these interfaces determine performance in terms of kinetics (charge-discharge rates) and understanding their reactivity is a key tool in understanding capacity fade and failure modes. Being able to monitor changes in real time and to follow uncontrolled reactions leading to high impedance and reduced energy and power output is of particular importance to control interfacial processes.

Research should target the investigation of interfaces over broad time and length scale through in situ methods and multi-technique probes, so as to correlate surface structure with its reactivity. The use of computational modelling tools is encouraged in order to complement molecular-level understanding of interfaces and help in designing high quality interfaces for batteries and supercapacitors with enhanced performance. The development and applications of methods to study interfacial issues of relevance to large (grid-scale) batteries or long term stability should be addressed by the project.

Funding scheme: Collaborative Project

Expected impact: The results should contribute to building the fundamental basis for the next generation of electrical energy storage devices.

Additional information: This pre-competitive topic has been developed based on the results of a workshops organized by the EC in collaboration with DoE and NEDO. The inclusion of top class research groups from US and/or Japan can help to ensure a wider impact. This will be considered during the evaluation under the 'Impact' criterion.

OCEAN 2013.4 Innovative transport and deployment systems for the offshore wind energy sector

(This Topic will be reproduced in the Work Programme of the Transport Theme, which will be the leading theme for this Topic in the context of the Joint Call "Ocean of Tomorrow").

In its Communication "Offshore Wind Energy: Action needed to deliver on the Energy Policy Objectives for 2020 and beyond", the Commission underlines that the exploitable potential of offshore wind by 2020 is likely to be 30-40 GW, and in the 2030 time horizon it could be up to 150 GW.

In 2007, the Energy Wind Association assessed that achieving 40 GW by 2020 will mean that 7,800 turbines of 5 MW need to be built building over the next 13 years. Those turbines have to be assembled, transported and installed on sites.

The Strategic Energy Technology Plan (SET-Plan) European Wind Initiative identifies transport and logistic issues as key elements for the deployment and maintenance of offshore wind farms. The TP Wind Strategic Research Agenda also points to research needs both in relation to the cost-effective installation, maintenance, operation and decommissioning of large offshore wind farms as well as to transport, logistics and equipment needs.

In its Communication on Strategic goals and recommendations for the EU's maritime transport policy until 2018, the Commission stresses that maritime transport is an important instrument of the European energy policy. Amongst others, offshore servicing vessels are considered as increasingly important aspect for ensuring the well functioning of the energy market.

Content/scope: Research activities under this topic shall address the following aspects:

- Development of innovative and cost-effective deployment strategies for large-scale turbines, including building and testing onshore;
- Elaboration of optimal logistical processes and on-land transport links for large offshore structures
- Design of novel vessel types and equipment for installation, maintenance and decommissioning and validation at reduced scale;
- Development of safety procedures for installation, operation and maintenance activities, regarding both offshore wind structures and the vessels;
- Improved operations and maintenance including the enhanced role of remote condition monitoring and systems with reduced human intervention;
- Development of new business models at European level for large offshore systems based on integrated life-cycle approaches;
- Development of methods and tools to assess the field performance of offshore wind farms servicing vessels and for optimised service activities in terms of lead time and energy usage;

Proposals shall include validation activities at reduced but industrially relevant scale using testing models and where possible tests at real scale using existing infrastructure and equipment, adapting those to validate models and management tools. Tests shall also address extreme conditions.

Funding Scheme: Collaborative Project

Expected impact: Projects will contribute to the implementation of the roadmap activity of

the European Wind Initiative aiming at supporting offshore take-off in the medium-term. Projects are also expected to contribute to the development of new niche markets for the European shipbuilding and shipping industries thereby contributing to competitiveness of the sector and to the creation of new jobs.

Additional information: Up to one project may be funded covering both ground based and floating wind parks.

The multi-disciplinary approach of the research undertaken is essential to address the topic. Knowledge exchange with oil/gas and maritime sectors is desirable. These aspects will be considered during the evaluation of the criterion related to "S/T quality".

The multi-sectoral composition of the partnership and the participation of industrial partners and relevant end-users are essential for the implementation of the project. It will be considered during the evaluation of the criterion related to "Implementation".

In the framework of the SET-Plan European Industrial Initiatives a specific monitoring and knowledge sharing mechanism will be established under the auspices of the Commission and the selected projects will be expected to participate.