ORIENTATION PAPER

prepared in connection with the FP7 2013 Work Programme in the area of

ENERGY

Important notice:

This paper is made public at an early stage in the adoption process of the work programme to provide potential applicants with the currently expected main lines of the 2013 work programme. It is a working document not yet endorsed by the Commission and its content does not in any way prejudge the subsequent modifications by the Commission, the subsequent formal opinion of the Programme Committee or the final decision of the Commission.

The final adoption and the publication of the work programme by the Commission are expected in mid-July 2012. Only the adopted work programme will have legal value.

Information and topic descriptions indicated in this orientation paper may not appear in the final work programme; and likewise, new elements may be introduced at a later stage. No essential information, such as indicative budgets, will be provided by the Commission until the final work programme is adopted. Any such information disclosed by any other party shall not be construed as having been endorsed by or affiliated to the Commission.

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ANNUAL WORK PROGRAMME 2013

ANNUAL WORK PROGRAMME

2013 COOPERATION THEME 5: ENERGY

Overall objective of the FP7 Energy Theme:

Adapting the current energy system into a more sustainable one, less dependent on imported fuels and based on a diverse mix of energy sources, in particular renewables, energy carriers and non polluting sources; enhancing energy efficiency, including by rationalising use and storage of energy; addressing the pressing challenges of security of supply and climate change, whilst increasing the competitiveness of Europe's industries.

I. CONTEXT

I.1. Political landscape

Against the backdrop of the current economic situation and increased global competition, the Union has defined a strategy to support growth and job creation, Europe 2020. The Innovation Union Flagship initiative supports this strategy through specific commitments. Research and innovation are key drivers of competitiveness, jobs, sustainable growth and social progress.

The work programme 2013 aligns with, and contributes towards, the objectives of Europe 2020, the Innovation Union Flagship, the EU's Energy and Climate policies, including the Energy Roadmap 2050, as well as other EU policies. There is a determined focus on fostering new ideas, supporting world class teams to generate solutions to address the Energy societal challenges, and on ensuring that the fruits of our investments can be properly exploited in Europe and be the basis for a global industrial leadership.

In this way the work programme provides for a smooth transition towards the new research and innovation programme for 2014-2020, Horizon 2020.

I.2. Approach for 2013

A technological shift in the EU's current energy system is necessary to achieve the 2020 targets and realise the 2050 ambitions to largely decarbonise energy and transport sectors. There is an urgent need of bringing new, high performance technologies to the market and to ensure the European leadership on low carbon energy technologies. The scale of investment, the high demand for cutting-edge research capacities and the global nature of technology markets require a European approach to energy research and innovation.

Activities in this work programme contribute to **supporting European Energy and Climate Policy initiatives**, the **implementation of the SET-Plan** – its Industrial Initiatives as well as its Research and Innovation agenda – while completing the portfolio of FP7 activities and **bridging to Horizon 2020**, the next EU Research and Innovation Framework Programme.

A major novelty of this work programme is the special emphasis on a cross-cutting approach in support of the new European Innovation Partnership on Smart Cities and Communities:

- **Smart cities and communities:** Smart Cities and Communities integrate energy, transport and ICT solutions to increase energy efficiency in urban environments. The goal is also to create new markets for the industry and to provide new or enhanced services to the end users and the citizens. In line with the proposal for an energy efficient Directive[1] and with the forthcoming Commission Communication on Smart Cities and Communities, activities of this work programme target industry-led large-scale demonstration of integrated, innovative and replicable solutions for more efficient buildings, electricity distribution grids and heating/cooling systems (Area 8.8). These activities are complemented by research on distribution grids and electric vehicles (topics 7.1.1, 7.3.1 and 7.3.2). Replication of successful solutions will ensure a high impact. These activities contribute to the SET-Plan Initiative on Smart Cities and Communities, which is also supported in other parts of the FP7 work programme 2013, notably by the ICT, Transport and NMP Theme.

In addition, this work programme will continue to support the following three priority areas:

- **Renewable energy sources:** The EU shall reach a share of 20% of renewable energy in its final energy consumption by 2020[2]. In support of the EU's energy and transport policy targets and in line with the forthcoming Renewable energy strategy, this work programme aims at increasing the competitiveness of a portfolio of renewable energy technologies for electricity generation (Activity 2 and 10), fuels (Activity 3 and 10) and for application in the heating/cooling sector (Activity 4). The priorities for solar energy, wind and bio-energy are in support of the SET-Plan Industrial Initiative's roadmaps and implementation plans which identify the key RD&D challenges for delivering cheaper and more efficient technologies and have been agreed by industry, Commission and Member States.
- **Smart grids and energy storage:** The integration of decentralised renewable energy sources and the completion of the internal energy market require more flexible and "smarter" electricity grids with appropriate storage options. Taking into account the Energy Infrastructure package[3] as well as the forthcoming Commission Communication on the internal energy market, actions in Activity 2 (topic 2.7.1), Activity 7 and Activity 10 aim at increasing the efficiency, flexibility, safety, reliability and quality of the European electricity systems and networks within the context of a more integrated European energy market. Priorities in these areas are in support of the roadmap of the SET-Plan Industrial Initiative on Electricity Grids.
- **Carbon Capture and Storage (CCS):** Capturing and storing CO2 is an important option for drastically reducing the adverse environmental impact of fossil fuel use on a European and global scale. Taking into account the forthcoming Commission Communication on CCS, actions in Activities 5 aim at increasing the efficiency of capture technologies and the reliability of geological CO2 storage, while actions in Activity 6 target reducing CO2

[1] COM/2011/0370 final
[2] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources
[3] COM/2011/0658 final

emissions from coal use through research on combining CCS and Underground Coal Gasification. These activities contribute to implementing the roadmap of the SET-Plan Industrial Initiative on CCS.

Finally, this work programme also contributes to the following cross-thematic **priorities**, whose centre of gravity lies on other programmes:

- **Oceans of the future**:
  - OCEAN 2013.4 Innovative transport and deployment systems for the offshore wind energy sector
- **Raw materials** - the following topic addresses related issues relevant to this priority:
  - Support to integrated research programmes between research performers on innovative research in support of the SET Plan Research and Innovation Agenda
- **Bio-resource efficiency** – the following topics address related issues relevant to this priority:
  - Topic ENERGY.2013.3.2.1: Pre-commercial industrial scale demonstration plant on paraffinic biofuels for use in aviation
  - 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
  - Topic ENERGY.2013.10.1.1: ERA-NET Plus – Bioenergy: Demonstrations of the European Industrial Bioenergy Initiative.

a) Innovation dimension of the activities

In line with the objectives of the "Innovation Union", this work programme strengthens the whole chain of research and innovation, from high risk / high impact frontier research to pre-commercial demonstration in order to accelerate the market uptake. The following innovation measures are in support of activities closer to market such as:

- Support to market-uptake, notably through more activities aimed at generating knowledge to deliver new and more innovative products, processes and services. This includes activities such as prototyping, testing, demonstrating, and knowledge transfer. See in particular (not exhaustive list)
  - Topic ENERGY.2013.8.8.1: Demonstration of optimised energy systems for high performance-energy districts
  - Topic ENERGY.2013.3.2.1: Pre-commercial industrial scale demonstration plant on paraffinic biofuels for use in aviation
  - Topic ENERGY.2013.7.2.3: Large-scale demonstration of innovative transmission system integration and operation solutions for (inter)connecting renewable electricity production
  - Topic ENERGY.2013.5.1.1: Scale-up of advanced high-efficiency capture

processes

- Industrial leadership is mandatory in all projects with a predominant demonstration component, in order to accelerate the market roll-out of low-carbon technologies, and encouraged in significant number of additional topics.
- Innovation is also encouraged by supporting demand-side measures such as standard-setting. See in particular:
  - Topic ENERGY.2013.7.2.3: Large-scale demonstration of innovative transmission system integration and operation solutions for (inter)connecting renewable electricity production
  - Topic ENERGY.2013.7.3.2: Enhanced interoperability and conformance testing methods and tools for interaction between grid infrastructure and electric vehicles
- User engagement is encouraged particularly in all projects which have a direct impact on the daily life of European citizens, such as Smart Cities and Smart Grids.

The focus on innovation and EU industrial plans is reflected in the description of the objectives and scope of the specific topics, as well as in the expected impact statements. The innovation dimension of the proposals will be evaluated under the 'Impact' evaluation criterion.

b) Bridging towards Horizon 2020:

This work programme is the bridge between the closing of FP7 and the forthcoming 'Horizon 2020'. In the spirit of the intervention logic of Horizon 2020 and in line with the conclusions of the European Council from 4 February 2011 [4], this work programme (in particular area 10.1) aims at **reinforcing cooperation with and among Member States** to implement the SET-Plan through joint actions, for example

- Topic ENERGY.2013.10.1.1: ERA-NET Plus – Bioenergy: Demonstrations of the European Industrial Bioenergy Initiative
- 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)
- Topic ENERGY.2013.10.1.2: ERA-NET Plus – European wind resources assessment.

In addition, the work programme supports the **integration of research programmes** in order to increase European coherence among national research operators through the pooling of research capacities, see in particular

- Topic ENERGY.2013.10.1.5: Integrated research programme in the field of photovoltaics
- Topic ENERGY.2013.10.1.6: Integrated research programme in the field of wind energy

[4] Council conclusion of 4 February 2011; EUCO 2/11 (note 10, 18)

- Topic ENERGY.2013.10.1.7: Integrated research programme in the field of bioenergy.
- Topic ENERGY.2013.10.1.8: Integrated research programme on smart grids
- Topic ENERGY.2013.10.1.9: Integrated research programme on electrochemical storage.

c) SME relevant research

Participation of SMEs has strongly been encouraged in the FP7 Energy Theme. Since the start of FP7, almost 20% of participants in the FP7 Energy Theme have been SMEs receiving around 20% of the total budget. The following topics of this work programme encourage explicitly the participation of SMEs:

- Topic ENERGY.2013.5.1.1: Scale-up of advanced high-efficiency capture processes;
- Topic ENERGY.2013.5.1-2: New generation high-efficiency capture processes;
- Topic ENERGY.2013.2.3.2: Small to medium wind turbines;
- Topic ENERGY.2013.4.1.1: Research and development of innovative solar thermal facades.

d) Dissemination actions

The calls are integrated in the **Monitoring and Review Framework of the SET-Plan**. Each funded project has to comply with and report according to the agreed Key Performance Indicators of the EIIs and agreed Knowledge Sharing Arrangements (including participation to the Energy Research Knowledge Centre)[5]. This enhances the dissemination and uptake of results from FP funding. National projects are also invited to join the knowledge sharing scheme to maximise its impact. The Energy Theme continues also its participation in the Open Access Pilot in FP7: project participants are required to deposit peer-reviewed articles resulting from projects to an institutional or subject-based repository, and to make their best efforts to ensure open access to these articles within six months after publication.

e) Overall expected impact

This work programme is expected to impact decisively the implementation of the industry-led European Industrial Initiatives of the SET-Plan by providing EU funding – that will leverage national resources – to tackle their research and demonstration priorities. As a consequence, these activities will boost the development of new energy technologies and their market roll-out for the transition to a low-carbon society.

[5] See http://setis.ec.europa.eu/implementation/eii-key-performance-indicators

I.3. International cooperation

All activities are open to researchers and research institutions from third countries and strong efforts are made to encourage them to seize this opportunity. Particular attention is paid to supporting strategic bilateral agreements and dialogues.

In view of the strategic importance of our Southern neighbourhood and in line with the Joint Communication 'A Partnership for Democracy and Shared Prosperity with the Southern Mediterranean', this work programme includes a Specific International Cooperation Action (SICA) on "Research cooperation and knowledge creation in the area of renewable energy in Mediterranean partner countries" (topic ENERGY.2013.2.9.1).

With a view to promoting international cooperation with selected countries, initiatives for collaboration between project(s) under the following topics and suitable project(s) funded by these countries will be encouraged on the basis of mutual benefit and reciprocity:

- Topic ENERGY.2013.5.1-2: New generation high-efficiency capture processes; (with Australia);
- Topic ENERGY.2013.7.3.3: Understanding interfaces in rechargeable batteries and super-capacitors through in situ methods (with industrialized and/or emerging countries).

Cooperation with Third countries or international initiatives is particularly encouraged in the following topics:

- 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;
- Topic ENERGY.2013.6.1.1: Combined Underground Coal Gasification and CO2 Capture and Storage;
- Topic ENERGY.2013.7.3.2: Enhanced interoperability and conformance testing methods and tools for interaction between grid infrastructure and electric vehicles;
- Topic ENERGY.2013.7.3.3: Understanding interfaces in rechargeable batteries and super-capacitors through in situ methods;
- Topic ENERGY.2013.10.1.2: ERA-NET Plus – European wind resources assessment;
- Support to joint programmes between research performers on innovative research in support of the SET Plan Research and Innovation Agenda.

International cooperation actions may also be part of the Integrated Research Programmes between research performers on innovative research in support of the SET Plan Research and Innovation Agenda supported under Area 10.1.

I.4. Cross Thematic approaches

Under the umbrella of the Smart Cities and Communities initiative this work programme contributes with the following topics to the PPPs on the European Green Cars Initiative and the Energy-efficient Buildings:

– ENERGY.2013.7.3.1 ("Planning rules for linking electric vehicles to distributed energy

resources"), and

- ENERGY.2013.7.3.2 ("Enhanced interoperability and conformance testing methods and tools for interaction between grid infrastructure and electric vehicles");
- ENERGY.2013.8.8.1 ("Demonstration of optimised energy systems for high performance-energy districts").

Special attention will be paid to cross-cutting marine and maritime research with the launch of a new cross-thematic call "The Ocean of Tomorrow": joining research forces to meet challenges in ocean management". It will be implemented jointly between Theme 2 "Food, Agriculture and Fisheries, and Biotechnology" (FAFB), Theme 4 "Nanosciences, Nanotechnologies, Materials and new Production Technologies" (NMP); Theme 5 "Energy", Theme 6 "Environment (including climate change)" and Theme 7 "Transport (including Aeronautics)". The main objective of the call is to promote research and innovation on marine technologies, in particular sensors, anti-biofouling materials, and innovative transport and deployment systems for the offshore energy sector. The topics and funding mechanisms will allow for large, multidisciplinary and multi-stakeholder topics with an appropriate balance between (basic/applied) research, knowledge transfer and demonstration, and to support a number of specific EU policies. "The Ocean of Tomorrow" call (FP7-OCEAN-2013) is a cross-thematic call and subject to a separate call fiche.

The following topic is implemented jointly by the ENERGY and FAFB Theme:

- ENERGY.2013.3.7.1: Support to the sustainable delivery of non-food biomass feedstock at pan-European level.

I.5. Socio-economic and gender dimension of research

The socio-economic dimension of energy research is integrated in relevant topics of this work programme, notably in:

- Topic ENERGY.2013.7.2.4: Ensuring stakeholder support for future grid infrastructures;
- Topic ENERGY.2013.9.2.1: European scientific multidisciplinary "think-tank" to support energy policy and to assess the potential impacts of its measures.

Where relevant, account should be taken of possible socio-economic impacts of research, including its intended and unintended consequences and the inherent risks and opportunities. Where appropriate, the projects should ensure engagement of relevant stakeholders and cultivate a multi-disciplinary approach (including, where relevant, researchers from social sciences and humanities). Projects raising ethical or security concerns are also encouraged to pay attention to wider public outreach.

All projects are encouraged to have a balanced participation of women and men in their research activities and to raise awareness on combating gender prejudices and stereotypes. Specific actions to promote gender equality in research can be financed as part of the proposal, as specified in Appendix 7 of the Negotiation Guidance Notes (http://ec.europa.eu/research/participants/portal/ShowDoc/Extensions+Repository/General+Documentation/Guidance+documents+for+FP7/Negotiations+and+amendments/negotiation_en.pdf)".

II. CONTENT OF CALLS

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

THE CHALLENGE-ORIENTED APPROACH OF THIS WORK PROGRAMME

This work programme follows the structure of the Specific Programme. The following table highlights the challenge-based approach of activities included in this work programme by grouping the specific topics along the main challenges addressed in this work programme.

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II.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 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.

II.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: High efficiency c-Si photovoltaics modules

Open in call: FP7-ENERGY-2013-1

Content/scope: Crystalline Si photovoltaics (c-Si PV) is the dominating photovoltaics technology today. Nevertheless, in order to achieve investment costs below 0.7€/W, an intensive and constant R&D support is required. Novel cell architectures and new processes should be developed and transferred as fast as possible into industrial applications.

The proposals shall focus on the scale-up of innovative (laboratory-scale) concepts. Device, process and equipment optimisation to target very high cell and module efficiencies, as well as high production throughput have to be considered at the same time. Proposals therefore shall address the following:

- High performance device concepts: innovative wafer-based silicon devices exploiting new cell architectures and new approaches, such as heterojunctions, rear contact cells, metal wrap through, or other.
- Processing and manufacturing: high-throughput and novel processes for layer deposition, metallization, etc., including the use of lasers, ion implantation and other advanced options; the entire manufacturing process up to module level and therefore also cell handling, interconnection, encapsulation, etc.

Reducing the environmental impact and cost of fabrication, taking into account lifetime and safety issues, and at the same time improving the efficiency of the technology, is a key objective. The proposals shall include a detailed impact analysis of the potential industrial take-up of the new technology developed in terms of production and market parameters. In particular, a cost analysis for a commercial production plant with annual production of 500 MW for the proposed technology must be included.

In order to ensure the industrial relevance and impact of the research efforts, the active participation of industrial partners represents an added value to the activities and this will be reflected in the evaluation, under the criteria 'Implementation' and 'Impact'.

This topic contributes to realising the Implementation Plan (2010-2012) and the Technology Roadmap (2010-2020) of the Solar Europe Industrial Initiative and funded projects will form

part of the SEII. 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.

Funding Scheme: Collaborative project

Expected impact: (i) Solutions going well beyond the state-of–the-art in terms of investment costs (target below 1 €/W) and efficiency targets at module level $\eta>21\%$ on mono and $\eta>19\%$ on multi-Si (ii) Stimulation and acceleration of the industrial take-up of promising results beyond laboratory scale; (iii) New competitive industrial processes.

Additional information: Up to one project may be funded.

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

Open in call: FP7-ENERGY-2013-IRP

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 activities shall take due consideration of the developments of the relevant regulatory framework, in particular the forthcoming Communication from the European Commission "Renewable energy: a major player in the European energy market".

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.

Additional eligibility criteria: The maximum requested EU contribution per project shall not exceed EUR 500 000.

Additional information: Up to one project may be funded.

See also Area Energy.2.9: Cross-Cutting Issues

II.2.2. Area Energy.2.2: Biomass

No topic is opened in this area.

II.2.3. Area Energy.2.3: Wind

Topic ENERGY.2013.2.3.1: Advanced aerodynamic modelling, design and testing for large rotor blades

Open in call: FP7-ENERGY-2013-1

Contents/scope: The main goal is to develop advanced rotor design models, using integral design tools in order to enable new and optimised designs for the next generation of large-scale wind turbines (up to 20MW). This includes research in aerodynamics, structural response and aerolasticity for full as well as segmented blade concepts.

The research may therefore involve the following areas of work:

- Definition on large-scale rotor blades and aero-tools for turbines to be developed and tested. For upscaling to be successful, a stepwise approach might be needed. Therefore, the project should focus on turbines in the 8 to 12 MW range but may as well pave the way for larger turbines up to 20 MW;
- Development of advanced aerodynamic modelling for selected elements, including flow devices for distributed aerodynamic control;
- Design and demonstration of new large-scale rotor blades and aero-tools.

Funding scheme: Collaborative Project

Expected impact: It is expected that the results of this research will contribute to making wind energy fully competitive (especially offshore), since larger, more reliable and more efficient rotors and blades have a direct impact on the generation of wind power and therefore on the cost of energy.

This topic contributes to realizing the Implementation Plan (2010-2012) and the Technology Roadmap (2010-2020) of the European Wind Industrial Initiative and the related EERA Joint Programme. The resulting project will form part of the EII.

***Additional information*:** Both industry and R&D community players should be involved in project consortium, in order to ensure the proper industrial implementation of the action at EU level in due time. This aspect will be taken into consideration in the evaluation.

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.

Topic ENERGY 2013.2.3.2: Small to medium size wind turbines

Open in call: FP7-ENERGY-2013-1

Contents/scope: The exploitation of wind energy in urban and periurban areas so far has been limited by the moderate wind regime, turbulence, visual impact, vibration and noise, which are all obstacles to the integration of wind turbines in zero energy buildings, high performance energy districts and decentralised power generation systems. This topic therefore is calling for new and innovative solutions to address these issues and improve the exploitation potential of wind energy in urban and periurban areas.

Making use of the recent substantial advances in the technology for large wind turbines, the development of new advanced materials and taking advantage of breakthroughs in other related scientific and technological fields, the projects are expected to substantially improve performance, ease of integration and penetration of small to medium size wind turbines in urban and periurban areas. The projects are expected to deliver low cost, high performance, reliable, durable and safe systems. The research may involve but is not limited to the following areas of work:

- Innovative design, materials and aesthetic solutions;
- New control systems and methods for optimization of operation and maintenance;
- Innovative solutions for transport, assembly and installation thereby minimizing impact in the construction phase.

The new wind turbine system designs shall be validated at pilot scale within the project duration.

Funding scheme: Collaborative Project

Expected impact: It is expected that the results of this research will increase the exploitation potential of wind energy in urban and periurban areas and hence help the wider dissemination of this technology at EU level, whilst also contributing to achieving the EU ambitious goal of a high share of renewable energy in the overall energy mix.

***Additional information*:** R&D community players, energy project developers, industry, urban planners shall be involved in project consortium to ensure swift market implementation of the developed innovative systems. Participation of SMEs is particularly encouraged.

Up to one project may be funded.

See also Area Energy.10.2 Other Horizontal Actions: Topic OCEAN 2013.4 Innovative transport and deployment systems for the offshore wind energy sector

II.2.4. Area Energy.2.4: Geothermal

Topic ENERGY.2013.2.4.1: Exploration and assessment of geothermal reservoirs

Open in call: FP7-ENERGY-2013-1

Content /Scope: The aim of this research is to develop reliable exploration methods for geothermal reservoirs. 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 development of a common and EU-wide accepted standardized protocol for characterization of geothermal potential will help to set up a clear and transparent European database.

The final result should be scientifically sound methods to assess the technical physical potential of geothermal reservoirs prior to drilling and utilisation, including appropriate software development and a clear definition of process indicators for measurements of magnitudes and acceleration.

Funding scheme: Collaborative Project

Expected Impact: Europe and the EU programmes in particular have invested successfully in EGS in the last years and now European industry has unique record of industrial exploitation of this technology. It is known that many sites in Europe are suitable for further development of geothermal energy. However, besides the issues of public acceptance, which could suitably be addressed by the recently established ERA-NET Geothermal Energy, 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. It is expected therefore that the developed reliable science based exploration and assessment methods for geothermal reservoirs under this topic would address this latter bottleneck and significantly enhance the potential of geothermal energy in the energy mix while also strengthening the leading role of the European Union in geothermal energy.

Additional information: Up to one project may be funded.

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

No topics are opened in this area.

See Area Energy.2.9: Cross-Cutting Issues.

II.2.6. Area Energy.2.6: Ocean

Topic ENERGY.2013.2.6.1: Design tools, enabling technologies and underpinning research to facilitate ocean energy converter arrays

Open in call: FP7-ENERGY-2013-1

Content/Scope: For many years, different individual (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 the ocean energy devices will perform, as well as their economic viability, is critically linked to their design, to a comprehensive understanding of the interactions which take place at this level, and to the development of necessary enabling technologies.

The objective of the research is therefore to develop optimal designs, enabling technologies and underpinning research to facilitates the development of ocean energy converter arrays. Research and development are needed at all levels, from moorings and foundations, operation and maintenance, power take off and electrical systems development, through to array and control system modelling and environmental impacts. The solutions developed should be applicable to as many devices and under as many different site conditions as possible. Solutions should be validated / trialled using existing installations, single devices or test centres.

Funding scheme: Collaborative Project

Expected impact: The optimisation of the design, development and operation of ocean energy arrays will contribute to the efficient and sustainable 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: Links with the wind offshore activities should be brought in to take advantage of the accumulated knowledge with establishment of offshore wind farms.

Up to one project may be funded.

II.2.7. Area Energy.2.7: Hydro

Topic ENERGY.2013.2.7.1: Optimisation of water turbines for integration of renewables into the grid

Open in call: FP7-ENERGY-2013-1

Content/Scope: The activities under this topic will focus on research and development to optimise water turbines for storage (as well as conventional) applications in energy systems incorporating a large share of intermittent renewable energy, encompassing both fresh and sea water environments. One particular problem in accommodating renewables in these systems is to cope with frequent and large load changes, fatigue loads and significant water level variations. The proposals shall involve modelling, hydraulic and mechanical design, new material use and fabrication techniques, model validation and prototype testing.

The aims are to significantly increase turbines efficiency, operating range, life time and unit response, while also extending the use of hydro storage in seawater environments.

The prototypes developed shall be tested in real conditions during the lifetime of the project.

Funding Scheme: Collaborative Project

Expected impact: The highly efficient turbines resulting from this project with larger operating ranges and faster unit response will increase the efficiency, potential and range of application (including in seawater environment) of hydro power storage (and generation) and hence help increasing the share of renewable energies into the grid.

Additional information: The active participation of the R&D community, industrial partners and technology suppliers, as well as of grid operators and energy project developers is essential to form a multidisciplinary consortium able to test in real conditions, promote project results and hence ensure swift market implementation of the developed innovations This will be considered during the evaluation under the 'Implementation' criterion.

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

Up to one project may be funded.

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

No topic is 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 with Mediterranean partner countries

Open in call: FP7-ENERGY-2013-1

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 cooperation on research and innovation in the area of renewable energy between European research centres and research organisations in the MPC. Such cooperation 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. Ideally each individual project will cover at least 3 out of the following 6 renewable energy areas: photovoltaics, concentrated solar power, solar-thermal, wind, bioenergy, grid integration.

Funding scheme: Collaborative Project for specific cooperation actions (SICA) dedicated to Mediterranean partner countries

Expected impact: The resulting projects 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 and thus also contributing to achieving the aims of the European external energy policy[6].

Additional information: Up to 2 projects may be supported for a total period of implementation per project of 4 years, 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.

[6] COM(2011) 539 final: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on security of energy supply and international cooperation - "The EU Energy Policy: Engaging with Partners beyond Our Borders"

Topic ENERGY.2013.2.9.2: Methods for the estimation of the Direct Normal Irradiation (DNI)

Open in call: FP7-ENERGY-2013-1

Contents/scope: Concentrating solar technologies need reliable estimates of the Direct Normal Irradiation (DNI). For example, Concentrated Solar Power (CSP) plants need forecasts for short term (45 - 240 minutes) and very short term (1 - 45 minutes) time horizons. The objective of the topic is to support the development and validation of a method for the estimation of the DNI. The method developed will have to provide estimates at a spatial and temporal scale which is relevant to the needs of CSP in the first place and possibly also for Concentrated Photovoltaics (CPV) and other applications. 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 ± 15%. The method developed should provide more reliable forecasts of the DNI, thus reducing the uncertainties affecting (i) the prefeasibility studies of new CSP plants and possible new CPV installations, and (ii) the electricity production of CSP plants in operation.

Additional eligibility criteria: The maximum requested EU contribution per project shall not exceed EUR 3 million.

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

Up to one project may be funded.

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

This activity encompasses research activities 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 topic is 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-2013-2

Contents/scope: The aim is to support the construction of pre-commercial plant(s) on paraffinic biofuels based on sustainable biomass feedstock. The call aims at industrially led projects with large-scale installed production capacity (ideally in the range of several thousand 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 relative demonstration scale plants with installed production capacity of about 1,000 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 edible oils are not covered by this topic and thus shall be considered out of scope. 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 topic is opened in this area.

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

No topic is opened in this area.

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

No topic is opened in this area.

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

No topic is opened in this area.

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

Topic ENERGY.2013.3.7.1: Support to the sustainable delivery of non-food biomass feedstock at local, regional and pan-European level

This topic is implemented jointly by the ENERGY and FAFB Theme but only open in call FP7-ENERGY-2013-1

Open in call: FP7-ENERGY-2013-1

Content/scope: In the context of the development of the Bioeconomy, the sustainable and reliable supply of non-food biomass feedstock (i.e. lignocellulosic biomass: agricultural and forestry residues and energy crops) is a critical success factor for the long-term perspective of biomass-based technologies to produce bioenergy and other bio-based products[7] on a large scale, while not competing with the food market and also benefiting the local rural communities.

The objectives of this project are to develop Strategies, Roadmaps and Tools (SRT) in support of decision-making at local, regional and Pan-European level. This will involve economic, social, environmental and logistics research building on most relevant data and projects[8].

The development of these SRT will have to confront and make use of a large number of available information including:

- Geographical and environmental (e.g. soil, water, climate, protected areas);
- Agronomical (e.g. best available and identified plant/tree varieties, agricultural and forestry practices including effect of biomass extraction on carbon cycle);
- Industrial (e.g. best available pre-treatment and conversion processes, considering also relevant pilot and demo projects[9]);
- Logistical (e.g. hubs and transportation routes);
- Economic and regulatory (e.g. CAP, RES Directive, strategies for rural and regional development, national support schemes, workforce).

Due consideration will be given to the development of small-scale plants suitable for decentralized operation with associated benefits to rural communities besides the centralized large-scale units involving long distance biomass transport.

The SRT will be offered to Member States, Associated and neighbouring countries in a sufficient number of regions for testing and validation, including the necessary ex-ante economic, social and environmental impact analysis.

The interaction and possible complementarities between these regional SRT at Pan-European level will be investigated. This could lead to suggest optimal flows of biomass feedstock to all uses and the best possible organisation of biomass pre-treatment and conversion plants at interregional levels.

[7] In this context, the term ‘‘bio-based product’’ means a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural or forestry materials or an intermediate feedstock.
[8] E.g. BEE, CEUBIOM, Biomass futures, Biomap, Biomass Trade Centres, BEn, Wood Heat Solutions, BioEnerGis, CAPRI, etc.
[9] E.g. Sector, Bioboost

Ultimately, the most promising logistic supply-chains at local, regional and pan-European levels will be further elaborated into a set of implementation plans. These plans should present notably the infrastructures needed, transport modes and flows of feedstock.

The South East European and East Neighbourhood countries[10] shall be considered as part of this Pan-European approach. Appropriate links will be made with relevant programmes and actions, notably in the context of the EU Agricultural, Environmental, Regional, Enlargement and Neighbourhood policies.

Once validated, most, if not all, SRT material shall be made public in a computerized and easy to use format with an adequate information campaign associated to it in the perspective of possibly developing it as an interactive and updatable reference tool.

Funding scheme: Collaborative Project

Expected impact: It is expected that the SRT developed would usefully support the local, regional and national authorities in their decisions for planning and strategy implementation with regard to the non-food use of biomass feedstock. It shall bring substantial environmental, economic and social benefits as opposed to the current largely individual decision-making by most of the concerned actors. The SRT 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 may 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.

The proposals should clearly identify the links with other relevant projects, how they plan to use synergies and avoid duplication.

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

Open in call: FP7-ENERGY-2013-IRP

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.

[10] Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia, Kosovo, Montenegro, Serbia, Turkey, 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 within the next ten years.
- Coordinating and possibly integrating the contribution of the biofuel community to the European Industrial Bioenergy Initiative (EIBI).

The activities shall take due consideration of the developments of the relevant regulatory framework, in particular the forthcoming Communication from the European Commission "Renewable energy: a major player in the European energy market".

The implementation of these activities shall involve close collaboration with EBTP. 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:
Increased communication between research and industry actors will facilitate exploitation of research results and hence the deployment of advanced, sustainable biofuel technologies all over Europe. 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.

Additional eligibility criteria: The maximum requested EU contribution per project shall not exceed EUR 500 000.

Additional information: Up to one project may be funded.

II.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: Research and development of innovative solar thermal facades

Content/scope: The topic aims to support applied research, development and validation of new solar thermal facade systems.

The project will develop new and innovative concepts of solar thermal facades which significantly improve the thermal performance of the building envelope (e.g. by means of advanced materials) and which provide a high solar fraction of the heating and cooling requirements (e.g. by means of innovative solar collectors and chillers). The proposed solutions shall offer a considerable contribution to the development of smart energy systems at the city or district level. The design and aesthetics of the proposed solutions shall also be properly evaluated.

The innovative solar thermal facades shall aim at significantly reducing the costs of components, assembly and installation and at also significantly facilitating and decreasing the costs of maintenance and repair.

The proposed solutions shall be validated at pilot scale within the project duration.

Funding scheme: Collaborative Project

Expected impact: The innovative easy-deployable solar thermal facades will contribute to increase the energy efficiency of the building stock and will help achieving the ambitious goals of a high share of renewable energy in the total energy mix.

Additional information: R&D community players, industry, construction companies and architects shall be involved in the project consortium to ensure swift market implementation of the developed innovative systems. Participation of SMEs is particularly encouraged.

II.4.2. Area Energy.4.2: Biomass

No topic is opened in this area.

II.4.3. Area Energy.4.3: Geothermal Energy

No topic is 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 topic is opened in this area.

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

No topic is opened in this area.

II.5. Activity Energy.5: CO_2 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: CO_2 Capture

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

Open in call: FP7-ENERGY-2013-1

***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 capture technologies (such as for example solid sorbents, cryogenics and membranes). They should define operating conditions and provide proof of the reliability and cost-effectiveness of these concepts 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, and should assess the environmental impact of the technology at plant scale.

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

Additional eligibility criterion: The requested EU contribution per project shall not exceed EUR 8 Million.

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.

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

Open in call: FP7-ENERGY-2013-1

***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 CCS technologies proven ate pre-demonstration pilot scale 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. Projects should actively contribute to the implementation of the Roadmap and Implementation Plan of the CCS Industrial Initiative of the SET-Plan, and, whenever relevant, contribute to the monitoring and knowledge sharing schemes of the Initiative.

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 endorsed by the Australian Department for Resources, Energy and Tourism (RET) or the Department of Industry, Innovation, Science, Research and Tertiary Education (IISRTE).

The participation of innovative SMEs is particularly encouraged.

II.5.2. Area Energy.5.2: CO_2 Storage

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

Open in call: FP7-ENERGY-2013-1

***Content/scope*:** Geological storage of CO2 must ensure the safety, reliability and controllability of the storage process, as well as address concerns about 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, as well as for sound approaches to safety assessment.

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 and brine out of the storage target. Results from the project - mitigation and remediation methodologies, safety assessment models - 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. They should actively contribute to the implementation of the Roadmap and Implementation Plan of the CCS Industrial Initiative of the SET-Plan, and, whenever relevant, contribute to monitoring and knowledge sharing schemes of the Initiative.

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. 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.

II.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

Topic ENERGY.2013.6.1.1: Combined Underground Coal Gasification and CO2 Capture and Storage

Open in call: FP7-ENERGY-2013-1

***Content/scope*:** Underground Coal Gasification (UCG) holds potential for reduced CO2 emissions per unit of gasified coal, for reduced impact from mining operations, and for using the site for CO2 Capture and Storage (CCS). However, the technology is still in a very early stage of development, and is also controversial because of environmental concerns. The process would be best used at limited depth for easier control, but if the process is not well-managed, UCG could potentially lead to groundwater contamination and/or soil subsidence. The understanding of UCG combined with CCS is limited, and many engineering and environmental challenges still remain. Projects should have a predominant research component, addressing both the environmental and engineering aspects. Emphasis should be on the integrated design, engineering and operation of UCG with reactor zone carbon sequestration, and on the coupled simulation of geomechanical and hydrological effects, including groundwater contamination and surface subsidence. Projects must clearly describe how they will build on and progress the state of the art as presented by previous and ongoing research, and shall aim to establish collaborative links with leading research projects in the field, both in and outside Europe.

Funding scheme: Collaborative Project

Expected impact: UCG with CCS would allow a more sustainable use of coal reserves by reducing the environmental impact of the mining and use of the coal. In addition, it would enhance security of supply of a widely used energy source, as it would allow gaining access to coal reserves that are technically or economically unmineable with present-day technologies, such as for example thin or offshore coal reserves. Bringing together international expertise and experience should result in the identification of best practice and provide clear guidance for possible future actions.

Additional information: An additional aim of this topic is to gain an international perspective. Active participation of non-European partners, in particular South-Africa,

Australia, U.S., India and China could add to the scientific and technological excellence of the project and lead to an increased impact of the research to be undertaken. Up to one project may be funded.

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

No topic is 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 topic is opened in this area.

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

No topic is opened in this area.

II.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 and validation of methods and tools for network integration of distributed renewable resources

Open in call: FP7-ENERGY-2013-1

Contents/scope: The aim is to develop and validate methodologies and tools to enable Distribution System Operators (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 Transmission System Operators (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 pilot-scale trials. The validation of new methods and tools should build on existing activities in different settings in Europe and form a family of projects. The project results should contribute to the implementation of the European Electricity Grid Initiative (EEGI). 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. The projects' results will contribute to the development of smart grids in both rural and urban areas. Exploration of synergies with Smart Cities and Communities will have to be ensured.

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

Open in call: FP7-ENERGY-2013-1

Contents/scope: Today's network reliability is guaranteed by the (n-1) criterion, which assures continuity of the electricity supply in case of loss of a single principal component, without instability or cascading issues. With the massive introduction of renewable energy sources (RES), a continuous but stochastic variation between full production and zero production or load is possible for numerous specific components of the network. As a consequence, the network reliability assessment and subsequent contingency measures need to be fundamentally changed to face the challenges of a complex and multi variable system, where the (n-1) criterion is no longer sufficient.

The aim of this topic is to identify, develop, assess and recommend innovative strategies, methods and tools to evolve current security criteria into more flexible criteria for the future pan-European electricity transmission system while maintaining present-day reliability levels. The new flexible security criteria should consider the substantial anticipated changes in the energy mix for future generation scenarios and recommend ways to allow this transition without jeopardizing current reliability levels. 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: With the results of the studies and tests conducted in this topic, Transmission System Operators will be able to propose new security criteria that allow the operation of their networks and particularly cross-border links closer to their physical limits. TSO's will be able to ship growing amounts of renewable energy across the pan-European grid while maintaining or even improving the current high level security of energy supply. While the time to build new lines is usually much longer than the time to build new generation, this will allow a high degree of integration of renewable sources at no expense of security of 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: Advanced tools and mechanisms for capacity calculation and congestion management

Open in call: FP7-ENERGY-2013-1

Contents/scope: The aim is to develop new capacity calculation methods for medium- to long- time horizons (week, month, year, multi-year ahead) and congestion management approaches in accordance with a new comprehensive reliability methodology being developed for the pan-European transmission network. The work should also develop the relevant tools supporting capacity allocation and congestion management.

Stakeholders such as TSO', market operators, regulators and market players have cooperated in establishing the broad lines of a target model for the European Electricity market. Many details and technical issues need to be further developed in particular for capacity allocation and congestion management. They need to take new developments into account in terms of approaches combining preventive and corrective measures for reliability assessment, and the ability to estimate a much more precise state of the system thanks to accurate, synchronised and high-sampling rate measurements.

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

Funding scheme: Collaborative Project

Expected impact: The results of this project should allow a correct prediction of the available capacity of transmission lines and cross-border interconnections, so that it can be efficiently allocated to market actors. The completion of the internal market creates increasing electricity flows and these are responsible for congestions particularly on cross-border connections. In view of the difficulty of building new lines, it is important to exploit existing connections to the maximum of their physical capacity. Advanced congestion management principles, methods and tools will give correct signals to the market, as to where true physical congestion exists in the network and should thereby minimize the societal loss due to limited network capacity.

Topic ENERGY.2013.7.2.3: Large-scale demonstration of innovative transmission system integration and operation solutions for (inter)connecting renewable electricity production

Open in call: FP7-ENERGY-2013-2

Contents/scope: This topic will primarily address the important technological challenges stemming from the large-scale penetration of renewable electricity production in the European transmission network, in particular the integration and transport of foreseen substantial renewable electricity production (including cross-national generation projects) far from

consumption centres (e.g. off-shore wind), possibly in combination with the inter-connection of EU member states' transmission networks to enable increased balancing and trade of electricity. In addition, the operationalisation and integration of storage systems in high voltage networks, as part of the technological solutions to the mentioned challenges as well as in response to the needs of managing the time shift between production and consumption and stabilising the grid, can be addressed.

The projects will propose innovative technological solutions to be implemented on one or several demonstration sites. They should cover at least one, and preferably more, of the following areas:

- Optimised technologies for connecting offshore wind farms to offshore transmission lines (both HVDC / HVAC), which could also interconnect two countries. Solutions to ensure system stability should be addressed, including wind farm and grid control methods and protection schemes and possibly alternative solutions for power collection systems in offshore wind farms.
- New cost-efficient DC technologies (e.g. HVDC VSC, DC breakers, DC/DC converters), including processes for ensuring HVDC grid control and protection;
- Reliable and cost-efficient multi-connector technology for multi-terminal grid solutions, in particular for offshore applications;
- Innovative technologies for new and more powerful interconnection of electricity networks, possibly demonstrating (i) innovative concepts for HV lines (AC and/or DC) and advanced cable technologies; and/or (ii) integration of large-scale storage in (inter-connected) high voltage network with high renewables share, possibly using the balancing opportunities offered by smart system operation.

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 environmental, economic, regulatory, institutional and social constraints and barriers that projects deploying the innovative technologies could face.

These activities should closely liaise with ongoing work on broadening cost-benefit analysis and on cooperation between Member States to streamline regulatory assessment and approval (under proposed Regulation COM(2011)658).

Standardisation and interoperability issues should be addressed, in order to enable multi-vendor compatibility.

The projects 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: The project 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).

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 proposals should seek strong synergies with projects of common interest to be identified under the proposed Regulation on trans-European energy infrastructure (COM(2011)658).

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.

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

Topic ENERGY.2013.7.2.4: Ensuring stakeholder support for future grid infrastructures

Open in call: FP7-ENERGY-2013-1

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. It should build on experiences and link with other projects on this topic in Europe, e.g under the Intelligent Energy Europe programme.

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 should contribute to the monitoring and knowledge sharing schemes of the EEGI.

Up to one project may 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

Open in call: FP7-ENERGY-2013-1

Contents/scope: The aim is to develop network planning rules and tools to enable electric vehicles in a large scale roll out and to maximise their potential for linking with and balancing of 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.

Funding scheme: Collaborative Project

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. The project should contribute to the monitoring and knowledge sharing schemes of the SET Plan European Electricity Grid Initiative. Furthermore the project is expected to establish cooperation and to coordinate with relevant projects under NMP, Environment, ICT and Transport to jointly support the EGCI PPP.

Additional information: Up to one project may be funded.

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

Open in call: FP7-ENERGY-2013-1

Contents/scope: The aim is to develop enhanced conformance testing methods and tools 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. Interoperability requirements should include a broad range of charging modalities, grid stability constraints and consumer needs including high energy supplier flexibility and a pan European market for both new and used EV. The work should be based on draft standards developed under M/453, M/468 and M/490. Developed testing methods should have a high degree of reproducibility and they should be validated through round robin tests and at relevant demonstration sites in the framework of the Smart Cities initiative and/or the European Electricity Grid Initiative. The project is expected to give strong contributions to standardisation working groups. It should furthermore ensure a strong link to international standardization and be open to cooperation with US stakeholders to promote cross certification wherever relevant.

Funding scheme: Collaborative Project

Expected Impact: The project should provide manufacturers of EV and EV infrastructure with cost effective conformance testing methods and tools for their products interaction with the European electricity network. Furthermore it should enable consumers to verify their expectations to pan-European interoperability of charging services. The project should contribute to the monitoring and knowledge sharing schemes of the SET Plan European Electricity Grid Initiative. Furthermore the project is expected to establish cooperation and to coordinate with relevant projects under NMP, Environment, ICT and Transport to jointly support the EGCI PPP.

Additional information: Up to one project may be funded.

Topic ENERGY.2013.7.3.3: Understanding interfaces in rechargeable batteries and super-capacitors through in situ methods

Open in call: FP7-ENERGY-2013-1

***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) as well as safety 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, safety issues 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 workshops organized by the Commission in collaboration with the US. The inclusion of top class research groups from industrialised and/or emerging countries is encouraged. In addition the proposal should allocate resources for 1-2 workshops aiming at exchange of information on the basis of mutual benefit and reciprocity with selected on-going projects in 3rd countries. Such projects may be identified by the Commission during the negotiation phase.

II.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 technologies that can dramatically **reduce energy consumption**. Smart cities and communities are planning and acting for a more sustainable future characterised by investments in innovative, integrated technologies and services such as heating, mobility, lighting, broadband communications and other utilities. They are developing and implementing, at district or corridor level or larger, intelligent solutions, enabled by ICT and the mobilisation of their social, industrial and environmental capital, that will empower citizens and coordinate the delivery of more efficient, integrated and enhanced energy and transport services for their inhabitants.

In this context, the Commission is moving towards a greater level of integration of topics that relate to Smart Cities and Communities in the energy, transport and ICT areas. Thus, projects supported under this area will have a high level of ambition in terms of integrated technology demonstration. It is envisaged that this approach will be continued and extended in future calls, providing a coherent set of activities from technology development to demonstration and ultimately laying the foundations for commercial roll-out via horizontal actions and market measures. This area of the Work Programme therefore encompasses energy-related topics such as energy efficiency, energy (electricity, heating and cooling) networks, and renewable energy production and urban planning. Innovative solutions are sought at the interfaces of these challenges as well as with other urban issues in the areas of ICT and transport.

Industry is invited to take the lead in close collaboration with cities to devise innovative measures that accelerate the deployment of low carbon technologies. In each project, partners from industry and research organisations from three Member States and/or Associated Countries are expected to team up with two or three cities to enhance the replication potential of the measures, to ensure their EU-wide impact and to facilitate the exchange of knowledge. Financial support will be given to measures that would help cities to substantially reduce greenhouse gas emissions in an innovative and integrative manner and represent a high replication potential.

Projects supported under this area will contribute to the Energy-efficient Buildings Public-Private-Partnership and are part of the Smart Cities and Communities coordinated call between the Energy and ICT Themes (FP7-SMARTCITIES-2013). For example, the topic under this area is complementary to the topic "Optimising Energy Systems in Smart Cities of ICT theme" in which the focus is on demonstrating the integration of renewable energy sources into electricity grids (including through the use of power electronics) and optimisation of heating and cooling systems for high performance energy efficient buildings.

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

Open in call: FP7-SMARTCITIES-2013

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 CO_2 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 the retrofitting of a district towards zero energy buildings plus at least one of the two remaining aspects below, 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 towards zero energy buildings.** The proposed measures should aim to demonstrate innovative technical, economic and financial solutions which significantly increase overall energy efficiency. All types of buildings can be addressed, with a focus on residential buildings. 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 social, 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. The monitoring programme should include behavioural aspects.
2. **Proposing innovative solutions for the medium and low voltage electricity distribution grid,** with the objective to improve the integration of a large share of power generated from renewable energy sources (for example photovoltaic installations) with the power supplied a conventional centralised installation (for example a Combined Heat and Power plant), and to increase energy efficiency of the distribution grid by implementing smart solutions and new efficient network components. In case of photovoltaic installations, the integration in the built environment of standardised PV building components requires both electric and architectural optimization, combining electricity production with substantial ICT part. Proposals should also consider electricity storage devices and strategies to better match supply with demand, optimise district and single building storage approaches, and provide ancillary services for the grid quality In addition, proposals 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 and/or cooling systems based primarily on recovering waste heat and adapting the temperature levels of the grid to the applications. Additional energy sources might include a significant share of local renewable energy sources supply. 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. Both short term and long term storage systems can be envisaged.

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 horizontal activities for good-practice sharing, such as CONCERTO and the Smart Cities Stakeholder Platform. Thus, they should allocate appropriate resources for comprehensive reporting and innovative dissemination measures.

Expected Impact: In addition to the impacts outlined for this Area in general, successful projects should set-up clusters of cities, and partnerships between cities and industries. Through integrated actions, projects should demonstrate their viability as new innovative market solutions and show a high replication potential for large-scale market deployment before 2020. An ambitious dissemination and market deployment plan should be included in the proposal. The credibility of this plan will form part of the evaluation.

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, given the local context (euros/efficiency gain; euros/CO2 reduction, kWh/m²/year saved). For this reason, the above figures should be indicated in the proposal. It is strongly suggested for participants to complete and include in the proposals the Building Energy Specification Table (BEST) summarizing this information for every type of building proposed. The template of the BEST table is made available through the relevant Guide for Applicants.

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.

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

II.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

No topic is opened in this area.

II.9.2. Area Energy.9.2: Scientific and Socio-Economic 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

Open in call: FP7-ENERGY-2013-2

Content/scope: The EU energy policy brings many new intellectual challenges, in particular, the need to develop a multidisciplinary approach to issues that are increasingly interconnected. Entirely new approaches and a paradigm shift on the energy system will be needed (increased used of RES, system integration approaches etc.). 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 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 predefine 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 relation to energy policy, especially energy technology policy. The Think Tank will also consider input from other advisory groups 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 eligibility criterion: The maximum requested EU contribution shall not exceed EUR 2 000 000.

Additional information: Consortium should have a track record in delivering policy advice, including universities, research centres and industry representative organisations. The proposed project duration is 36 months. Due to the nature of the activities to be carried out, up to one project may be funded under this topic.

II.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: Integration of the European Energy Research Area

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 Plan[11]. 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.

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

Open in call: FP7-ERANET-2013-RTD

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

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

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 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, to enable the provision of accurate wind resource and external wind load climatology and short term prediction at high spatial resolution. These models should consider bathymetry, meteorological and oceanographic data (e.g. wave height, mean wave period and wave direction). 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.

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.

The results of this project should be made publicly available for the production of an electronic European wind atlas, including the underlying data and a new EU wind climate database, 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. 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 sitting) will be developed. This type of atlas should become a useful spatial planning tool for public authorities and decision-makers.

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.

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

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 and/or regional 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 or regional 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 increase the alignment between national and/or regional funding programmes leading to joint programming and opening of calls during the project lifetime.

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 allow collaboration and alignment with the work of the EERA Ocean Energy Joint Programme and will enhance synergies and raise the scattered profile of a sector having difficulties to build a mature industrial and commercial status.

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.

Topic ENERGY.2013.10.1.4: Mobilising the research, innovation and educational capacities of Europe's universities

Open in call: FP7-ENERGY-2013-IRP

Content/scope: Universities play a key role in the innovation system of the SET-Plan, in particular in energy related basic science, future enabling technologies and in education and training. In addition, universities participate in the joint programmes of the European Energy Research Alliance and cooperate with industry e.g. in the framework of the European Industrial Initiatives and the Knowledge and Innovation Communities of the European Institute for Innovation and Technology.

This topic supports the cooperation among universities and between universities and other innovation actors in order to mobilise the capacities of Europe's universities to contribute to the aims of the SET-Plan and the next European research and innovation framework programme, in particular in the fields of research and education. The goal is to increase the impact of universities' involvement in the SET-Plan by reducing existing fragmentation e.g. in the educational system and by stimulating joint activities among universities and with other stakeholders, taking into account and linking to the work of existing relevant networks such as the European Platform of Universities Engaged in Energy Research (EPUE) and the KIC Innoenergy.

This topic supports the following activities:

- Activities to ensure and facilitate coordination and information flow among universities active in energy research and with the other stakeholders of the SET-Plan. This could include organisation, management and follow up of meetings as well as setting up internet based information system.
- Mapping of research and education capacities with respect to academic research and technical personnel, research projects, partnership with industry and Masters and PhD programmes. This mapping exercise should seek to reveal the extent and degree of interdisciplinary collaboration in research and education programmes which currently exist, and how this can be maximized and further promoted.
- Development of clusters of excellence, based on areas of core competence of universities such as frontier research and education and training and design of common activities within these clusters.
- Reinforcing links to the European Energy Research Alliance and to other energy innovation actors as well as participation in relevant SET-Plan related activities such as the Education and Training Initiative.

Funding scheme: Coordination and Support Action (supporting)

Expected impact: To better coordinate and maximise the impact of universities' participation in SET-Plan activities.

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

Open in call: FP7-ENERGY-2013-IRP

***Context/scope*:** Without a technological shift in our current energy system, the EU will fail on its 2050 ambitions to largely decarbonise the energy and transport sectors. Europe needs to develop and introduce into the market new generations of technologies, not just any low carbon technologies, but technologies that depart fundamentally in their underlying principles, performances and economics to stand a chance to compete with conventional energy and it needs to do so throughout the entire transition period. This long-lasting and demanding challenge places a strong call for long term research to generate new concepts and ideas and to overcome market showstoppers of these breakthrough technologies.

Europe has a long standing position in research excellence. However the race for industrial leadership that is going on worldwide is calling for unprecedented resources and capacities in cutting-edge research and it has to last for decades. If the Union is to maintain and expand its competitiveness in the global clean energy technology market, energy technology innovations requires a new more effective approach across the Union—and that approach calls for integrating much further capacities and resources in high risk technology research at EU level, shifting to a programme logic rather than a project logic.

The objective of this topic is to support the operation and delivery of integrated research programmes that bring together and integrate on a European Scale, programmes of a critical mass of research performers from different Member States, Associated Countries, and, if appropriate other third countries, to advance the longer term research agenda of the SET Plan roadmaps[12] in the fields of solar photovoltaic, wind energy, smart grids, energy storage and bio-energy. This topic represents a pilot exercise for a new way of working at EU level on longer-term research that could be further developed in the next European Framework Programme for Research and Innovation.

Each integrated research programme shall be focused on one of the above technology areas, including aspects related to materials. An integrated research programme shall clearly show and justify its European Added Value compared to efforts undertaken at national level. The scope and complexity of the research shall address areas that individual research programmes could not address alone and/or for which working at European level brings in economies of scale and raises significantly the level of excellence. It shall be based on a transparent governance and management structure that integrates and operates seamlessly research facilities and resources, including in-kind, from the different research programmes and organisations involved against a common research work-plan.

To this end, the integrated research programme should combine, in a closely co-ordinated manner:

- Integrating activities to lay the foundations for long-lasting research cooperation, including legal, managerial and administrative aspects.
- Exchange of researchers to ensure an efficient implementation of the research work-

[12] 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]

plan and to facilitate the co-operation between research organisations and scientific communities;

- Joint activities to foster the use of existing research facilities to create a European dimension and activities to support scientific communities and industry in their access;
- Joint research activities, to improve, in quality and/or quantity, the services provided by the programmes and to fill gaps in the existing 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.
- Transfer of knowledge activities. These activities aims at reinforcing the partnership with industry in the context of the SET Plan European Industrial Initiatives e.g., activities to foster the use of research outcomes and infrastructures by industry as well as to include industrial needs into the research priorities.
- Proposals could include actions on international cooperation, such as lab-to-lab cooperation with third countries.

The proposals shall detail the research competencies and infrastructure available within the integrated research programme to implement all necessary categories of activities. In addition the proposals shall include a description of the governance that will be established to implement the integrated research programme as well as management and resource (funding and human resources) plans. A letter of endorsement of the research institutions underpinning the integrated research programme shall be provided in the proposals. The political support from relevant national authorities should also be confirmed in the proposals.

Implementation: Support to an integrated research programme will, in this pilot phase, be given for a duration of 4 years. For all necessary categories of activities the proposal shall describe precise deliverables and the Key Performance Indicators against which the programme will be monitored 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 areas for which concrete progress can be made within the four year period, clearly indicating those parts of the overall programme for which co-funding from the EC is sought to achieve a greater impact. Proposers should also describe the complementary activities of the integrated programme that will be developed in parallel with the co-funded activities and the expected results. Proposals shall also include a longer 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 these needs in the future, notably in view of bridging to Horizon 2020, the next Framework Programme for Research and Innovation.

Funding Scheme: Combination of Collaborative Project and Coordination and Support Action (CP-CSA)

Expected Impact: Integrated research 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 integrated research programmes and to offer an improved access to researchers. Integrated research programmes should also contribute to increase the potential for innovation of the related research programmes, in particular by reinforcing the partnership with European industry, through e.g. transfer of knowledge and other dissemination activities, activities to foster the use of research outcomes by industry.

The scale of resources, including in-kind, brought in to the overall integrated research programme is a crucial factor for its impact and will be evaluated under the 'Impact' criterion.

Additional eligibility criteria: The maximum requested EU contribution per project shall not exceed EUR 10 million.

Additional information: Given the required maturity of the integrated research programmes, it is expected to receive a single proposal per technology area.

Up to one integrated research programme per technology area is expected to be funded. Taking into account the available budget, proposals across all technology areas will be in competition against each other.

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 integrated research programmes will be requested to participate. Also, the Commission will ensure proper linking, where appropriate, between these integrated research programmes, as well as with other relevant SET Plan initiatives, in particular the European Industrial Initiatives.

Reporting will be expected to provide a complete overview on progress of the overall programme, but financial reporting will be limited to those parts receiving co-funding from the EU.

Transparency and openness are considered to be an essential element for the success of these integrated research programmes and this should be reflected in the proposals. The programmes should ensure openness to include potential new members that can fulfil the criteria defined at the proposal stage. The criteria should be fair and coherent with the selection of the founder members of the programme. Transparency and openness of the programmes will be evaluated in the programme annual reviews.

International cooperation activities should bring added value to integrated research programmes. The programmes ultimately supported under this action could be requested to participate, in the course of the execution of the project(s), in workshops with targeted third countries to exchange information on the basis of mutual benefit and reciprocity.

Proposals will be evaluated against the evaluation criteria for CP-CSA presented in section V of this work programme.

Topics opened:

Topic ENERGY.2013.10.1.5: Integrated research programme in the field of photovoltaics

The integrated research 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.2013.10.1.6: Integrated research programme in the field of wind energy

The integrated research 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.2013.10.1.7: Integrated research programme in the field of bioenergy

The integrated research programme supported 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.2013.10.1.8: Integrated research programme on smart grids

The integrated research 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 Integrated Research Programme 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.2013.10.1.9: Integrated research programme on electrochemical storage

Electricity 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 integrated research 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.

Topic ENERGY.2013.10.1.10: Integrated Research Programme in the field of Concentrated Solar Power (CSP)

The Integrated Research Programme supported under this topic should contribute to the medium to long term objectives of the SET Plan in the field of CSP, anticipating the long term perspective of the Solar European Industrial Initiative (SEII). The programme aims at preparing the next wave of CSP industrial demonstration and deployment. It will support the study of innovative concepts leading to highly efficient and cost effective applications of the CSP technology, possibly in combination with other technologies. It will address current shortcomings (e.g., in terms of water consumption) as well as new avenues for CSP applications.

II.10.2. Area Energy.10.2 Other Horizontal Actions

The Ocean of Tomorrow 2013: Joining research forces to meet challenges in ocean management

Please note that a separate orientation paper on "The Ocean of Tomorrow 2013" potential joint call will be tentatively published and it is therefore ***not developed in this orientation paper****. For details on the topics, please consult the relevant document on the Participant Portal (https://ec.europa.eu/research/participants/portal/page/fp7_documentation).*

The aim of this potential call will be to support the EU integrated maritime policy's objective of a thriving maritime economy, making the most of marine resources in an environmentally sustainable manner, in line with the EU Strategy for Marine and Maritime Research . The Strategy helps deliver the full potential of the maritime economy to the 'Europe 2020' goal of a smart, inclusive and sustainable growth for Europe.

The tentative orientation paper for "The Ocean of Tomorrow 2013" will possibly include four actions as follow:

- *Biosensors for real time monitoring of biohazard and man made chemical contaminants in the marine environment*
- *Innovative multifunctional sensors for in-situ monitoring of marine environment and related maritime activities*
- *Innovative antifouling materials for maritime applications*
- *Innovative transport and deployment systems for the offshore wind energy sector*