

**Draft Horizon 2020 Work Programme 2016-2017
in the area of
Societal Challenge 3 "Secure, Clean and Efficient Energy"**

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This paper is made public just before the adoption process of the work programme to provide potential participants with the currently expected main lines of the work programme 2016-2017. It is a working document not yet endorsed by the Commission and its content does not in any way prejudge the final decision of the Commission.

The adoption and the publication of the work programme by the Commission are expected in mid-October 2015. Only the adopted work programme will have legal value.

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Introduction

The European Energy Union, as set out in the recent framework strategy¹, calls for increased energy security, solidarity and trust, a fully integrated European energy market, improved energy efficiency contributing to the moderation of demand, a decarbonisation of the economy as well as increased efforts as regards research, innovation and competitiveness.

With more than EUR 1 billion dedicated to supporting energy-related research and innovation activities in 2016-2017, this Work Programme is as a key instrument to progress towards an European Energy Union which provides EU consumers – households and businesses – with secure, sustainable, competitive and affordable energy. Achieving this goal will require a fundamental transformation of Europe's energy system

Important milestones for this transformation are the EU's energy and climate targets for 2030 which also underpin Europe's leading role in the fight against climate change: at least 40% domestic reduction in greenhouse gas emissions compared to 1990, at least 27% for the share of renewable energy consumed in the EU, at least 27% improvement of energy efficiency and an electricity interconnection target of 10%².

Responding to the challenges highlighted in the Energy Union framework strategy and building on the priorities identified in the Set-Plan Integrated Roadmap³, this work programme part will put particular emphasis on enabling the participation of consumers in the energy transition, and improving the efficiency of the energy system, especially as regards the building stock and developing the next generation of renewable energy technologies and their integration in the energy system (including energy storage). To increase the leverage of EU activities, this work programme part strengthens cooperation with national funding programmes – based on discussions between Member States/Associated Countries and the European Commission on the updating of the SET-Plan – and provides support for first-of-a-kind, commercial-scale industrial demonstration projects.

More specifically, activities included in this work programme part contribute to the two focus areas "Energy Efficiency" and "Competitive Low-Carbon Energy". The "Smart Cities and Communities" under the "Smart and Sustainable Cities" focus area is included in the cross-cutting part of the work programme (Annex 20). Activities cover the full innovation cycle – from 'proof of concept' to applied research, pre-commercial demonstration and market uptake measures. This work programme part also includes a range of activities aiming at facilitating the market uptake of energy technologies and services, fostering social innovation, removing non-technological barriers, promoting standards and accelerating the cost effective implementation of the Union's energy policies.

¹ See 'Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy', COM (2015)80 final

² EUCO 169/14

³ See <https://setis.ec.europa.eu/set-plan-process/integrated-roadmap-and-action-plan>

The transformation of the energy system encompasses technological, societal, cultural, economic and environmental aspects and calls for a more important role for citizens and communities. New approaches will therefore have to be stimulated as regards business models, competitive services, and an increasingly smart and dynamic system utilizing, wherever possible, a multi-disciplinary approach, integrating different social sciences and humanities fields. This systemic approach is in line with the Horizon 2020 Responsible Research and Innovation⁴ (RRI) cross-cutting issue, engaging society, integrating the gender and ethical dimensions, ensuring the access to research outcomes and encouraging formal and informal science education.

Efforts to secure Europe's technological leadership must be complemented by production capabilities and technology supply chains across Europe. Industrial participation in the programme is therefore crucial. Given the central role of SMEs as a source of innovation, growth and jobs, this work programme features a number of topics particularly tailored to the needs of SMEs, including one topic for the SME instrument.

Energy being a cross-cutting issue, the Horizon 2020 Energy Societal Challenge exploits synergies with other relevant areas, e.g. information and communication technologies and material-related research. In addition, the Energy Challenge contributes to the 'Blue Growth' focus area as well as to the Public Private Partnerships on Energy-efficient Buildings and Sustainable Process Industries (SPIRE). Whilst projects are expected to contribute to a more sustainable energy system, technology development is encouraged to comply with the Circular economy principles⁵.

International cooperation with strategic partner countries and global technology leaders will support European energy and climate objectives and contribute to the global efforts to mitigate climate change and reduce CO₂ emissions. In line with the EU's strategy for international cooperation in research and innovation⁶, all activities are open for third country participants⁷; in addition, certain partner countries are also specifically targeted in a number of topics⁸.

This work programme also encourages synergies between Horizon 2020 and other European Union funds, such as European Structural and Investment Funds (ESIF) that can increase the impact of both funds in terms of scientific excellence and place-based socio-economic development respectively⁹. The European Regional Development Fund (ERDF) will invest

⁴ http://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November.pdf

⁵ COM(2014) 398

⁶ COM(2012) 497

⁷ Note that participants from industrialized and emerging countries outside of the EU are not automatically eligible for EU funding. For detailed rules concerning participation from third countries see Article 10 of the Rules for the Participation.

⁸ Topics specifically targeting third countries: LCE-22,-2016, LCE-23-2016, LCE-24-2016, LCE-27-2017, LCE-29-2017, LCE-30-2017.

⁹ Examples are the development and equipment of innovation infrastructures or the fostering of innovation skills through ESIF that enable the participation in a Horizon2020 project, or the transfer of knowledge and

about EUR 100 billion (estimated) in R&I in the period 2014-2020 and EUR 38 billion (estimated) in low carbon economy that will fund among others the take-up of energy efficiency and renewable solutions¹⁰. Applicants could be interested in investigating additional, complementary or follow-up funding for their projects in their region/country. To achieve this, applicants could seek contact with the ESIF managing authorities¹¹ and the authorities who developed the Research and Innovation Smart Specialisation Strategy for their EU Member State or region¹².

All activities should demonstrate a good understanding and handling of ethical aspects and promote the highest ethical standards in the field. The most common issues to be considered include personal data protection and privacy, protection of participants and researchers and ensuring informed consent, involvement of vulnerable population, the potential misuse of the research results, fair benefit sharing when developing countries are involved and the protection of the environment.

A novelty in Horizon 2020 is the Pilot on Open Research Data which aims to improve and maximise access to and re-use of research data generated by projects. Projects funded under 'Smart Cities and Communities' (in the cross-cutting part of the Work Programme 2016-17 (Annex 20)) will by default participate in the Pilot on Open Research Data in Horizon 2020. Projects funded under the other calls of this Work Programme may participate in the Open Research Data Pilot in Horizon 2020 on a voluntary basis¹³.

Activities specifically targeting Fuel Cells and Hydrogen are not supported in the calls 'Energy Efficiency', 'Competitive Low-Carbon Energy' and 'Smart Cities and Communities', but through calls for proposals of the Fuel Cells and Hydrogen JU¹⁴.

technologies resulting from Horizon2020 projects to firms that can, thanks to ESIF support, develop it further, test, prototype, etc. towards innovations fit for market take-up. ESIF can also be used to expand the support and advisory services for potential Horizon2020 participants. ESIF can also help deploying innovative solutions emanating from Horizon2020, e.g. through public procurement.

¹⁰ See http://ec.europa.eu/regional_policy/activity/index_en.cfm

¹¹ See http://ec.europa.eu/regional_policy/indexes/in_your_country_en.cfm

¹² See <http://s3platform.jrc.ec.europa.eu/eye-ris3>

¹³ Projects have the possibility to opt out of the Pilot under certain conditions. Participation in the Pilot is not taken into account during the evaluation procedure. In other words, proposals will not be evaluated favourably because they are part of the Pilot and will not be penalised for opting out of the Pilot. A further new element in Horizon 2020 is the use of Data Management Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a DMP is required for projects participating in the Open Research Data Pilot. Other projects are invited to submit a DMP if relevant for their planned research. Only funded projects are required to submit a DMP. Further guidance on the Pilot on Open Research Data and Data Management is available on the Participant Portal.

¹⁴ <http://www.fch.europa.eu/>

Call - Energy Efficiency Call 2016-2017

H2020-EE-2016-2017

INTRODUCTION

Moderating energy demand can be considered as 'the foundation of the energy transition'¹⁵. A high level of energy efficiency is beneficial for security of supply, sustainability, affordability for households and industry and competitiveness of the EU economy. It is one of the key objectives of EU energy and climate policy, as set out in the recent Energy Union Communication¹⁶, the 2014 European Energy Security Strategy¹⁷ and Energy Efficiency Communication¹⁸.

Achievement of the EU's energy efficiency objectives for 2030, as endorsed by the European Council in October 2014, will require a strong boost in Research and Innovation (R&I) investments to remove current technological and market uptake obstacles.

In order to achieve this, an update of the EU's energy research and innovation policy, the Strategic Energy Technology (SET) Plan, has been launched with the aim of strengthening it and making it more effective in meeting its objectives. As a first step, a large number of stakeholders representing the entire energy system have been working together to identify the new R&I challenges and needs. This consultation exercise has resulted in a document titled "Towards an Integrated Roadmap" which identifies four key challenges for the entire energy system, among which are the need to increase energy efficiency in buildings, heating and cooling, industry and services, and the need to activate consumers at the centre of the energy system.

At the same time, the comprehensive regulatory framework that is currently in place to guarantee further progress in energy efficiency needs to support R&I actions. This would enable faster market penetration of innovative energy saving technology solutions and services, as well as removing persistent (and mostly non-technological) market and non-market barriers to improving energy efficiency.

Building on the priorities of the consultation under the SET-Plan's "Towards an Integrated Roadmap", the Energy Efficiency area of this Work Programme has been designed for 2016/2017 with a stronger focus on consumer-related issues under the sub-area '**Engaging consumers towards energy efficiency**'. In addition, a strong consumer-oriented approach characterises many of the topics in the sub- areas of '**Heating and cooling**', '**Buildings**', '**Industry, products and services**', and '**Innovative financing for energy efficiency**'.

¹⁵ Strategic Energy Technology (SET) Plan, *Towards an Integrated Roadmap: Research & Innovation Challenges and Needs of the EU Energy System*, 2014, p.8.

¹⁶ COM(2015) 80 final

¹⁷ COM(2014) 330 final

¹⁸ COM(2014) 520 final

The sub-area 'Engaging consumers towards energy efficiency' aims at changing consumer behaviour with respect to the uptake of sustainable energy solutions. In the future private consumers should be more aware and active, as well as playing a more prominent role by producing energy for their own consumption, where this is possible. Engagement actions are therefore needed to address non technological barriers and to achieve behavioural change towards more sustainable choices and decisions for energy. On the other hand, research is needed to better understand consumer's decision making and to quantify the positive impacts of energy efficiency, in order to improve the design of future energy policies and to better reflect the behaviour of consumers in energy models. It is also necessary to demonstrate that ICT-based solutions can contribute to saving energy by supporting behavioural change in energy end-users. Finally, as stated in the Energy Efficiency Directive¹⁹, public bodies at all levels should play an exemplary role as regards energy efficiency; actions are therefore sought to engage and increase the capacity of public authorities to develop and implement ambitious sustainable energy policies and plans.

Particular attention is given to the **Buildings** sub-area (representing 40% of final energy consumption), which offers the highest potential for efficiency improvement and savings on energy bills. The focus is on reducing the cost of renovations targeting improved energy efficiency, while also increasing the depth and rate of renovation with the aim of achieving Nearly Zero-Energy Buildings (NZEB) performance. Buildings should maintain high levels of indoor environment quality (thermal comfort, air quality, etc.). Attention is also given to removing market barriers, stimulating the market for energy efficiency driven renovations, enabling further harmonisation in calculation of energy performance and certification of buildings, and coherent cost-effective methods to assess achieved energy performance in use. In addition a qualified building workforce is needed, therefore appropriate certification and accreditation schemes to continuously improve the knowledge and skills of the building workforce are expected. Particular emphasis is placed on the citizen's engagement in energy efficiency as well as on interoperability and interaction with energy grids of the building and its energy management systems. The activities of the contractual Public-Private Partnership on Energy efficient Buildings will also contribute to this sub-area.

Under the **Heating and cooling** sub-area the challenge is to moderate the demand for heating and cooling, increase energy efficiency in supply, maximise the use of renewable energy and reduce costs of heating and cooling to affordable levels for all. Therefore, also in line with the Commission's decision to bring forward a heating and cooling strategy in 2015, research and innovation actions in this Work Programme focus on optimising and matching efficient and sustainable heating and cooling supply, improving our understanding of barriers hindering the development of this market, developing models and tools for heating and cooling mapping and planning, investigating heating and cooling systems and solutions using low and very low temperature resources, as well as stimulating market uptake measures based on the replication of successful approaches for the retrofitting of inefficient district heating networks. Appropriate consideration needs to be given to solutions for the development and effective

¹⁹ 2012/27/EU

management of district heating/cooling systems with cost-effective and efficient management and reuse of waste heat.

The **Industry, products and services** sub-area is aimed at improving the energy efficiency of products, production processes and technologies in support of the competitiveness of EU industry and services, taking into account the EU's energy and climate objectives. In the area of industry, energy efficiency investments can lead to important productivity and operational benefits which can represent up to 2.5 times (250%) the value of energy savings²⁰. This is why design of manufacturing processes, energy recovery, energy audits and energy management systems, re-use of industrial waste, optimisation of the value chain and industrial symbiosis will all be addressed. Development and market uptake of innovative highly efficient energy-related products, systems and services will also be part of the scope.

The **Innovative financing for energy efficiency** sub-area aims to deliver more investment through stronger private capital participation in energy efficiency investment markets, addressing a financing need of around EUR 100 billion per year. Activities are focussed on the development of innovative financing mechanisms, investment instruments and schemes for energy efficiency that allow the demonstration and uptake of business cases related to energy savings, and kick-starting a large scale market for energy efficiency finance. Emphasis is given to increasing investor confidence, capacity building, leveraging existing solutions and rollout of energy services with the aim of bringing the relevant stakeholder groups and market organisations closer together in order to speed up development of the market.

1. HEATING AND COOLING

Heating and cooling constitutes around half of the EU's final energy consumption and is the biggest energy end-use sector, ahead of transport and electricity. Around 85% of heating and cooling is produced from natural gas, coal, oil products and non-RES electricity. Only 15% is generated from renewable energy. This shows that the heating and cooling sector has a crucial role to play in the EU's transition towards an energy efficient and decarbonised energy system and in achieving long term energy security. The challenge is to moderate demand for heating and cooling, to increase energy efficiency in supply, to maximise the use of renewable energy and to reduce the cost of heating and cooling to affordable levels for all.

The use of renewable energy and local sustainable resources (e.g. residual sources of heat) is key to decarbonising heating and cooling supply systems and improving their efficiency. Further research and demonstration is required in order to develop new and to improve existing technological solutions that are able to take advantage of these energy sources.

Moderating energy demand and switching heating and cooling to renewable and other local sustainable resources is at the core of the European energy transition, which is underpinned by

²⁰ The multiple Benefits of Energy Efficiency: A guide to quantifying the value-added", IEA, 2014

the Energy Union Communication²¹ and by Directives on renewable energy²², energy performance of buildings²³, eco-design and energy labelling²⁴. The Energy Efficiency Directive²⁵ contains provisions that require Member States to take into account the potential of efficient heating and cooling at local, regional and national levels. In this context it is important to develop tools that are user friendly and easy to deploy, and to ensure that planning of heating and cooling becomes a mainstream practice for public authorities and economic actors.

Despite the existence of technically proven cost effective, efficient and renewable energy-driven heating and cooling systems, there is a need to increase capacity and capability in the supply chain, to improve customer acceptance of low carbon heating technology and to develop credible commercial models for delivery that would support wider market roll-out. Issues relating to energy system integration also need to be addressed in order to facilitate and accelerate the technology shift. Integrated approaches need to be deployed to provide solutions for holistic organisational, managerial and financial measures that facilitate and accelerate the technology shift.

Proposals are invited against the following topic(s):

EE-01-2017: Waste heat recovery from urban facilities and re-use to increase energy efficiency of district or individual heating and cooling systems

Specific Challenge: Europe is not recovering enough of its waste energy. A vast amount of waste heat is produced in urban areas from a range of local sources (e.g. from metros, large buildings, extensive ventilation systems) and from urban waste or waste water systems. Data centres are another rapidly growing sector generating heat that could potentially be recovered and reused for heating or cooling buildings.

Thermal energy captured can be supplied through individual central heating and cooling systems or distributed through district heating and cooling networks to multiple buildings. In some cases, it might be needed to combine the recovery of waste heat with different technologies, (e.g., heat pumps) in order to bring the temperature level of the waste heat to those matching the existing heating and cooling applications addressed in the proposal.

Scope: Demonstrate waste heat and waste water heat recovery in urban areas, in services sector and transport system facilities and their connection and integration into the existing

²¹ COM(2015) 80 final (A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy)

²² 2009/28/EC (Directive on the promotion of the use of energy from renewable sources! <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028>

²³ 2010/31/EU (recast) (Energy Performance of Buildings Directive) <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN>

²⁴ 2009/125/EC and 2010/30/EU (Ecodesign and Energy Labelling Directives) <http://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficient-products>

²⁵ 2012/27/EU (Energy Efficiency Directive) <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>

heating and cooling supply systems in buildings/facilities or district heating/cooling systems. Focus should be given to replicability, scalability and modularity that facilitate application and rapid deployment. Develop sustainable business models and organisational, managerial, and financial solutions for deployment of the proposed technological solutions in the EU, with due regard to the legislative framework.

Projects should build on previous projects supported under FP7 and Horizon 2020. The activities are expected to be implemented at Technology Readiness Level (TRL) 6-8 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 million would allow this challenge to be addressed appropriately. This does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings and GHG emission savings triggered by the proposed actions (compared to best available solution existing today);
- Increase in share of waste heat captured and utilised in urban areas;
- Scale of the replicability potential of the proposed solutions.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-02-2017: Improving the performance of inefficient district heating networks

Specific Challenge: District heating's share on heat supply in Europe is about 12%, with some Member States and Associated Countries having a much higher share. In order to preserve existing heating networks and to increase their efficiency, successful approaches to diagnosing and retrofitting inefficient networks, including sustainable business and organisational models, have to be widely promoted and disseminated.

Many systems are old and inefficient and run using fossil fuels. These systems often have poor maintenance, high customer heat costs and limited ability for user control undermining the image of district heating. The result is that a significant number of customers disconnect from district heating networks and install individual heating systems which do not always take advantage of the potential for efficiency gains. The retrofitting of these district heating systems can offer a cost effective approach to supplying efficient heat. Schemes can include city-wide networks or networks at the district/neighbourhood level.

Scope: Actions are needed to accelerate the cost effective and energy efficient retrofitting existing, inefficient district heating networks.

Activities supported under this topic should replicate or develop successful technical, managerial, organisational and financial approaches and should lead to the initiation of concrete schemes that guarantee substantial primary energy savings and efficiency gains, including the use of renewable and residual sources of heat as appropriate. Proposals should engage and involve as necessary, those in charge of city networks, district heating companies, managers of buildings blocks, housing associations and other building owners/managers and end consumers. Proposals should also lead to the development of concrete regional or national action plans for the retrofitting of inefficient district heating networks.

As necessary, actions should consider interventions that are needed on the building side, e.g. retrofitting and / or modifications of internal heat distribution systems and system and end user controls. They should also take into account the evolution of thermal demand in the future due to improving building energy performance standards and increased rate of building renovations.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this challenge to be addressed appropriately. This does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings and GHG emission savings triggered by the proposed actions (compared to best available solution existing today), considering the different climate regions of Europe;
- Increased share of waste/residual and renewable sources of heat;
- Scale of the replicability potential of the proposed solutions;
- Number of retrofitting approaches initiated by the project within its duration which are integrated in the regional or national action plans.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-03-2016: Standardised installation packages integrating renewable and energy efficiency solutions for heating, cooling and/or hot water preparation

Specific Challenge: In order to increase the roll-out in the market of new technologies for heating and cooling, Innovation Actions are needed to bring forward combined, adaptable and plug-and-play solutions. For these to be successful, the costs and energy benefits should be further demonstrated. The challenge is therefore to develop new heating/cooling and/or hot water preparation systems and demonstrate their real potential.

With the growing contribution of intermittent renewable energy sources, the use of thermal energy storage will grow in importance. The uptake of systems that use or combine renewable energy sources, energy storage or smart controls is still relatively low. Integration with other parts of the building (including historical buildings) or its services is an unresolved issue due to lack of planning and simulation tools and the lack of expertise and confidence among designers and installers. Instead, they stay with conventional heating and cooling solutions, which results in a negative lock-in effect.

Packaged systems claiming high levels of energy efficiency are already available in the market; however their potential is not always demonstrated in place, which develops into a lack of trust in new solutions. Therefore, there is a need to demonstrate the real potential of the new solutions by providing information on the overall system performance to the end user.

Scope: Actions are needed for the development and demonstration of cost-effective compact and fully integrated heating and cooling units installed at the building level. Applications should: demonstrate their cost-effective integration in buildings, demonstration of high values of seasonal performance, fossil fuel and/or primary energy savings considering a wide range of both new and existing buildings and allow for remote access and control. Proposals could develop methods and parameters to support design and installation of multi-component heating, cooling and/or hot water preparation solutions. Proposals should also include consumer information system on the overall system performance. In addition, remote inspection of these systems should be made possible. The solutions may include the use of renewable energy including heat pumps, co-generation, thermal storage or smart controls that should be used with the specific aim to minimise primary energy demand (gas, electricity). Proposals should take into account the need for high indoor environmental quality (thermal comfort, acoustics, air quality, etc.). The focus of the solutions should be on scalability, modularity and adaptability, easy integration, assembly and installation. Quality and technical reliability are also important aspects to ensure that solutions deliver their potential. Inspection and monitoring should be considered, building upon the requirements of the EPBD²⁶ (articles 14 and 15). For the purposes of calculating and showcasing their energy performance, the solutions should also build upon the package labelling scheme established under regulations 811/2013 and 812/2013 (where applicable).

Projects should involve producers of different heating and cooling technologies and control systems, installer associations, designers and architects. The activities are expected to be implemented at Technology Readiness Level (TRL) 6-8 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 million would allow this challenge to be addressed appropriately. This does not preclude submission and selection of proposals requesting other amounts.

²⁶

(2010/31/EU) Energy Performance of Buildings Directive <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN>

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings and GHG emission savings triggered by the proposed actions (compared to best available solution existing today) ;
- Demonstration of smart controls to optimise energy demand and energy supply at the building level;
- Demonstration of solutions allowing better remote operation, monitoring and inspection;
- Roll-out in the market of standardised compact installation packages integrating multi-components (hybrid) renewable and energy efficiency solutions;
- Impact on heating and cooling industry as a whole (not just for a specific product).

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-04-2016-2017: New heating and cooling solutions using low grade sources of thermal energy

Specific Challenge: In their vast majority, heating and cooling demand is supplied using high valued energy sources e.g. electricity and fossil fuel driven appliances. However, there is a wide range of thermal energy sources²⁷ which due to their temperature levels are not generally used to deliver useful heating and/or cooling.

On the one hand, the share of low valued energy sources in the supply of useful heat and cooling can be increased if low exergy systems²⁸ are used.

On the other hand, a number of technologies can be used to take advantage of low/moderate temperature resources²⁹, e.g. by upgrading them in order to generate useful heating and cooling and, in some cases, also electricity.

Scope: Actions are needed to develop, demonstrate, validate and improve the overall efficiencies of:

- technologies that are able to use low valued (low-grade) energy sources (residual and renewable sources of thermal energy) in low-exergy heating and cooling systems.

²⁷ Sources of residual and renewable energy e.g. sewage water, underground resources, solar heat, low grade waste heat, etc.

²⁸ In the context of this topic this refers to systems able to deliver useful heating and cooling using low grade energy sources, e.g. sources of heating or cooling at temperature levels close to room temperature for space heating and cooling applications

²⁹ The levels of temperature referred to as low/moderate will depend on the concrete application

- technologies that are able to take advantage of very low and low (moderate) temperature resources, e.g. by upgrading them, in order to generate useful heating and cooling³⁰ and if relevant electricity. (e.g. heat pumps able to harvest low-grade heat, heat driven chillers and heat driven combined heat and power cycles). Necessary attention should be paid to improving system reliability and automated operation.

Proposals are expected to address one or both of the two areas mentioned above, as necessary. The activities are expected to be implemented at Technology Readiness Level (TRL) 4-6 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

The scope of this topic might change in 2017 to investigate the applicability of low and very low temperature district heating for buildings with high thermal performance. This will depend on the conclusions of the Heating and Cooling Strategy by the end of 2015 and will be subject of a Work Programme revision in 2016.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings and GHG emission savings triggered by the proposed solutions (compared to best available solution existing today);
- Increased share of residual and renewable sources of thermal energy in the supply heating and cooling demand;
- Gains in the overall efficiencies of heating and cooling systems using very low and low (moderate) temperature sources of thermal energy.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-05-2016: Models and tools for heating and cooling mapping and planning

Specific Challenge: There is a need to better identify, analyse, model and map resources and solutions making energy demand more efficient and match it with efficient sustainable energy sources at the least cost. Such public planning is already mandated in the Energy Efficiency Directive through the 5-yearly Comprehensive Assessment for efficient heating and cooling. This needs to be done at local, regional and national levels to help develop energy strategies

³⁰ In here useful heating and cooling can embrace, as relevant to the proposed action, all types of end uses and temperature ranges (e.g. space heating and cooling, hot water preparation, supply of industry processes, etc.)

and ensure their consistency at national level and with EU policies. Today only a few public authorities have the expertise, knowledge and tools to perform heat and cooling mapping and planning. The future demand on public energy planning necessitates that such modelling tools are available and used as part of the policy making processes of public authorities.

Scope: Actions are needed to mainstream and further develop methods and tools of heating and cooling planning (heat planning) in the administrative practices of public authorities. Heat planning is an iterative process, as plans need to be updated regularly³¹.

The planning tools should be able to process large and complex data sets to provide a detailed and comprehensive description of the existing energy system and the dynamic development of all relevant supply and demand elements within a given geography (generation units, renewable and residual energy sources, infrastructures, buildings' energy consumption and quantity and 'quality' (temperature) of the thermal supply sources and that of the demand) and allow modelling of the possible scenarios reflecting hourly, seasonal and yearly variations in supply and demand to optimally reach energy goals. The heat and cooling mapping tool should be able to link with other types of maps (e.g. spatial, infrastructure, renewable energy sources maps). It should be capable of modelling flexibility needed for integrating variable renewable energy, and demand response and enable analysing the impact of the increasing number of low energy buildings (building renovation programmes, introduction of Nearly Zero Energy Buildings).

The modelling tools should be user friendly and open source yet able to model the full energy system, i.e. heating and cooling, electricity and transport. The tools should include instruction and training modules and be validated, demonstrated and piloted with the target groups. The activities are expected to be implemented at Technology Readiness Level (TRL) 5-7 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2.5 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Better integration of heating and cooling mapping in existing energy models and in the regional and local planning;
- Number of people within the target groups trained on the use of the models and tools developed;

³¹ This is essential, if the EU is to achieve its 2020 and 2030 energy efficiency objectives and further progress with energy demand moderation. The Energy Efficiency Directive (2012/27/EU) mandates that the national Comprehensive Heating and Cooling Assessments are updated every five years; updates should be of increasing accuracy, coverage and efficacy.

- Adoption / implementation of the developed models and tools beyond the project duration;
- A credible approach demonstrating that data acquired during the project will be shared through open data.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

2. ENGAGING CONSUMERS TOWARDS SUSTAINABLE ENERGY

The transition towards a more sustainable energy system will require not only implementation of technological solutions but also a change in consumer behaviour with respect to the uptake of energy efficiency solutions and growing use of renewable energy sources. Consumers need to be at the centre of the energy system; they need to be informed, engaged and activated. To this end, it is necessary to achieve a deeper understanding of consumer behaviour and motivation structures within the complexity of different user groups. Engaging consumers is a difficult task since energy consumption is often “hidden” and is a by-product of other everyday activities. However, the activation of consumers can be facilitated by user-centred innovative technologies, products and services.

Liberalisation of the energy market across Europe is expected to lead to a number of benefits for European consumers. However, there are still a number of technological and non-technological barriers that prevent consumers from taking full advantage of a liberalised energy market and, eventually, of becoming 'prosumers', as well as preventing them from taking informed decisions to reduce their energy consumption. A focus on energy consumers will also help understanding of different types of consumers, and how they should be variously addressed, engaged and activated.

The consumer area in the present work programme addresses some of these barriers.

Research and Innovation Actions are needed to better understand how consumers take decisions, how ICT-based solutions could help them to adopt more energy efficient behaviour, how they interact with the energy system, and which macro-economic impacts are related to consumers' decisions.

Moreover, since many barriers are non-technological, and many solutions already exist in some parts of Europe (but not yet in others), Coordination and Support Actions would help consumers to overcome these barriers. These actions will improve information and feedback mechanisms and support consumer engagement, in order to motivate changes in consumption behaviour and investment decisions and to increase consumers' knowledge, skills and competences.

The Energy Efficiency Directive³² (EED) explicitly states that public bodies at national, regional and local level should play an exemplary role as regards energy efficiency. However, staff working in the public sector often lack the capacity to perform this role. Innovative strategies are therefore sought to raise the capacity of public authorities to fulfil their obligations under the EED and to increase public engagement in the energy transition, as well as supporting those private stakeholders and civil society actors that need to be involved in the definition and/or implementation of sustainable energy policies and measures.

Proposals are invited against the following topic(s):

EE-06-2016-2017: Engaging private consumers towards sustainable energy

Specific Challenge: Consumers should be considered at the heart of the energy system and become active market players. The future private consumer should be more aware, active, energy sufficient, as well as being a prosumer producing energy for their own consumption, where this is possible. Furthermore, in view of the rise in energy prices, consumers are spending an increasing share of their income on energy, with estimates stating that more than 50 million Europeans are affected by energy poverty³³. Energy efficiency, energy savings and increased use of locally produced, including own produced, renewable energy are key tools in addressing fuel poverty.

In this context, engagement actions are needed across Europe in order to achieve behavioural change towards more sustainable choices and decisions for energy. This includes increasing and understanding consumer 'apetite' for higher efficiency products.

Although awareness on the benefits of collective consumer action in the field of EE and RES has increased in past years, such action is still hampered by a number of barriers, including financial and regulatory barriers and inconsistencies in grid integration practice. In addition, insufficient use of relevant ICT solutions and insufficient understanding of energy bills contribute to hampering the achievement of a more sustainable energy system.

Scope: Develop and roll out tailored and effective and innovative engagement actions to motivate changes in consumers' sustainable energy behaviour that would result in reduced energy consumption in buildings, heating/cooling systems and/or appliances. The proposed actions should focus on clearly defined target groups of private consumers (individuals or collectives), using market segmentation³⁴. The proposed actions should demonstrate an understanding of different types of behaviours and consider the different approaches needed to influence them. The actions should also address the risk of "rebound effects", propose measures to counteract them, and apply current theory and practice on consumer decision

³² 2012/27/EU (Energy Efficiency Directive, <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>)

³³ EESC (2013/C/341/05) referring to the European Fuel Poverty and Energy Efficiency project, 2009

³⁴ Market segmentation: this involves dividing a bigger target group into subgroups of consumers with common needs and priorities, and developing and implementing specific actions to target them. As an example, vulnerable consumers may be considered too wide a target group and further segmentation would be expected.

making processes (e.g. effects of new technologies on energy behaviour). All relevant stakeholders necessary for the successful implementation of the action should be involved and it is expected that relevant consumer organisations, in particular, are either directly involved or their support is clearly demonstrated in the proposal. Where relevant for the proposed action, gender issues should be taken into account, in particular the role gender characteristics may play in influencing consumer behaviour. Actions should preferably cover a wide geographic area through complementary actions covering various parts of the EU.

The proposed action should cover one or more of the following:

- Empower and facilitate actions for consumers to become prosumers, or to form collective consumer groups/consumer cooperatives (addressing energy efficiency and/or renewable energy, and energy storage, where applicable, with a focus on action).
- Support clearly defined groups of vulnerable consumers in tackling fuel poverty by facilitating more sustainable energy behaviour and choices in their everyday life, without compromising comfort levels. This should also aim at achieving structural changes of national policies to specifically address fuel poverty and could include the transfer of best practices for the active engagement of vulnerable consumers.
- Facilitate wider deployment and consumer adoption of existing ICT-based solutions, for energy efficiency and information on energy consumption and costs, with a focus on action and resulting in improved understanding of ICT interfaces and information depiction (including smart metering and related systems).
- Facilitate consumer understanding of energy bills (on and off line), leading to actions allowing for a reduction in energy consumption. Such actions should ensure robust monitoring to demonstrate the effectiveness of the approach proposed,
- Create better instruments for improving consumer understanding and routing purchase decisions towards higher efficiency products, ensuring high performance in the areas important to health and wellbeing at the same level of effectiveness and with no additional relevant environmental impacts,
- Distilling policy lessons from the market insight gathered as a means to review existing, and produce better, legislation.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the scope of the proposal:

- Primary energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding);
- Number of people changing their behaviour and taking informed decisions, documenting why and how changes are an effect of particular measures taken, as well in terms of the sustainability of the behavioural change;
- Number of consumers engaged by actions aiming at improving consumer understanding and routing purchase decisions towards higher efficiency products;
- Renewable Energy production and Investments in sustainable energy triggered by the project within its duration (*for actions on prosumers/consumers groups*, respectively in GWh/year and million Euro of investments per million Euro of EU funding);
- Policies and strategies created/adapted to include fuel poverty (*for actions on fuel poverty*, to be measured in number of citations / statements from governance bodies).

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-07-2016-2017: Behavioural change toward energy efficiency through ICT

Specific Challenge: The objective is to demonstrate that ICT-based solutions can contribute to saving energy by motivating and supporting behavioural change of energy end-users.

The main challenges are (i) establishing cost-effectiveness, i.e. demonstrating that solutions allow a good return on investment through energy savings (ii) making energy usage data accessible to the consumer and to designated third parties (for application development or designing new business models around them) and (iii) demonstrating that energy savings can be achieved without compromising comfort levels.

Scope: Activities are focused on the development of innovative user-friendly digital tools and applications or services making use of energy end-user generated information or captured from in-home equipment/sensors (like smart meters, communication-enabled heat metering tools, smart plugs, smart appliances and/or energy-aware products), in possible combination with intelligent controls and automation, with the purpose to significantly enhance energy efficiency by behavioural change of end-users taking informed decisions. The solutions will focus on empowering consumers (buildings managers, buildings owners as well final users including residents, housing associations, visitors, public actors, etc.) to engage and collaborate in achieving energy savings and allowing them to explore different means and measures to manage their energy needs over the longer term.

Proposers should integrate and validate different technological elements, each element with at least TRL 6 (see General Annex G), combined with appropriate business models and social acceptance parameters.

Insights from social and behavioural sciences should be used to understand: (i) factors influencing consumer choices and (ii) the impact of consumer behaviour on the energy system. Where relevant, gender, socio-economic, demographic and cultural differences should be identified and taken into account as a means of segmentation and tailoring actions to target groups.

The proposals should respond to the following:

- The need for efficient and compact consortia, involving, as appropriate, ICT developers and providers, manufacturers of home appliances, energy experts, social sciences and humanities experts, citizens representatives, as well as utilities (DSOs or retailers), energy service companies (ESCOs) and building managers.
- The impact of indoor climatic conditions on personal health, productivity and comfort.
- The developed solutions should be deployed in a variety of building types located in at least two different climatic regions. Access to the buildings should be guaranteed, together with all relevant building information, including smart metering infrastructure.
- The proposed solutions shall be deployed and validated in real environments, clearly defined and monitored, for a period of at least 1 year, ensuring credibility and consistency of conclusions. Validation should cover business models and RoI, and should include detailed plans for sustainability and large-scale uptake beyond the project lifetime.

ICT solutions should primarily address energy efficiency, but may integrate other solutions including also indoor climate, building/home security or health monitoring. This "packaging" approach would need to demonstrate the added benefits for consumers, as well as the market potential.

Proposals should take into consideration the projects supported under the topic EE 11 of the Work Programme 2014-2015 of the H2020 Energy Challenge³⁵.

The topic EUB-02-2017 ("Utilities: energy management at home and in buildings") in Part 5.i. Information and Communication Technologies of the Work Programme/ LEIT is also relevant and addresses similar challenges.

The proposers should explain in detail how they will address possible ethical issues like research on human participants and personal data protection.

The proposers should also explain what will happen after the end of the action of any project-related equipment deployed in buildings for the purpose of the project. Costs for the purchase of mobile devices like mobile phones, tablets as well as cost for services of internet connections are not eligible under this topic.

³⁵ CORDIS website: http://cordis.europa.eu/home_en.html

Proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets):

- Significant reduction of final energy consumption prompted by innovative ICT solutions clearly quantified and substantiated, and subsequent reduction of CO₂ emissions.
- Accelerated wider deployment and adoption of user-friendly ICT solutions prompting behavioural change and energy efficiency, including plans for its sustainability after the project's life and potential/readiness for replication.
- Number of energy end-users changing their behaviour documenting why and how changes are an effect of particular measures taken, as well in terms of the sustainability of the behavioural change.

The proposals should quantify foreseen impacts, using preliminary but credible baselines and benchmarks to substantiate calculations and clearly demonstrate how the energy savings will be measured and reached.

Proposals are encouraged to take advantage of using the already developed common methodologies for calculating energy savings in public buildings and social housing³⁶.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-08-2016: Socio-economic research on consumer's behaviour related to energy efficiency

Specific Challenge: In most of the existing economics energy models it is generally assumed that energy consumers behave in an economically rational way. However, empirical data show that consumers are rather 'bounded rational', because of effects such as split preferences, perceived financial barriers, lack of knowledge/ information, or the implicit costs of the transaction. The different energy efficiency policies implemented in the EU try to remove the different financial and non-financial barriers to incentive energy consumers to invest in cost-effective energy efficiency technologies.

Empirical research is needed to better understand consumer's decision making to improve the design of future energy efficiency policies in such a way that existing barriers can be

³⁶ For this purpose, an associated software tool called eeMeasure was created with the respective common methodologies for recording energy savings (<http://82.165.143.35:8080/emeasure/orhttp://www.smartspace.eu/news-events/news-details/article/emeasure-calculation-of-energy-efficiency-in-buildings-web-portal-is-now-publicly-available-fo/>).

removed, to better reflect the behaviour of consumers in energy models and also to better reflect the impact of energy efficiency policies on the different consumers' decision making processes in energy models.

Scope: Proposal should advance the current knowledge on how the different consumer groups make their energy efficiency investment decisions and how energy efficiency policies can have an impact on financial and non-financial barriers in the decision making process making use of market data, large sample-surveys and other empirical sources in addition to a theoretical analysis. As different factors influence the individual choice of consumers the empirical analysis needs to be done for all consumer groups. For households there might be differences dependent on the income level, age, education, gender, tenant/landlord etc. that should be better investigated. In addition, there might be also a geographical differentiation of consumers with regard to energy efficiency investments. The decision of other consumer groups invest in energy efficiency, like companies in the service sector, in agriculture or in industry might be influenced by other factors.

In addition, research should also investigate the differentiation between possible energy efficiency investments which are influenced by different factors, e.g. decisions to invest in the renovation of buildings have a different time horizon than investments in energy efficient products (washing machine, TV etc.). Such analysis should also take into account country-specific factors.

Discount rates are used in many energy models to reflect the inter-temporal decision making of consumers and to describe the economic actor's behaviour. To improve energy models the results should be based on robust empirical data to apply appropriate discount rates or other parameters to support the analysis and development of energy efficiency related policy strategies. Proposals should visualise their research results and include tailored communication activities to clearly defined target groups. Where appropriate, they should take gender issues into account. Proposals should fill knowledge gaps not yet covered by former or ongoing research projects and take into account existing macro- and microeconomic models and results of socio-economic sciences and humanities. The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to improve the current methodologies and empirical base used to quantify the positive impacts of energy efficiency policy and to improve the evidence-base for a better development of future energy efficiency policies and energy models, evidenced for example by the number of public officers and other stakeholders influenced or references to impact assessments, strategy papers or other policy documents.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-09-2016-2017: Engaging and activating public authorities

Specific Challenge: Due to their spending power and pivotal role within the community, the public sector is an important driver in supporting a market transformation towards more efficient energy systems, buildings, products, services and towards stimulating a general public behaviour for increased uptake of energy efficiency solutions.

One of the key challenges remains in linking up public bodies at the national, regional and local level through effective multi-level governance to realise an energy transition driven from the local level with concerted planning and implementation of energy projects, as well as in achieving a coherent transformation of the energy system capitalising on synergies and economies of scale.

Scope: a) Actions aiming at engaging public authorities – open in 2016

Proposals demonstrating an innovative approach in empowering public authorities to step up their active role to develop, finance and implement ambitious sustainable energy plans and measures (for instance by capitalising on synergies with the Covenant of Mayors or Smart Cities & Communities or similar public initiatives), on the basis of reliable data. Public actors are encouraged to adopt a multi-stakeholder approach and to look at sectors with high energy saving potential such as buildings, industry and urban mobility, as well as to take into consideration the integration of relevant indoor environment quality³⁷ criteria regulations when increasing energy efficiency performance of buildings.

Proposals should focus on one of the following topics:

- Raising the capacity of Member States to fulfil their obligation under the Energy Efficiency Directive, Energy Performance of Buildings Directive, Ecodesign and Labelling Directives (e.g. monitoring on the energy efficiency progress and policies)
- Innovative ways to enable public engagement in the energy transition, developing interface capacities within public authorities to engage with civil society
- Supporting public authorities to foster integrated energy, transport mobility and land-use planning at local level
- Supporting public authorities to foster multi-level governance, linking up local, regional and national levels for delivering integrated sustainable energy planning and projects to achieve synergies and economies of scale
- Enhance and create appropriate structures for rolling-out quality management and certification schemes for energy efficiency/renewable energy targeted in municipalities,

³⁷ Indoor environmental quality includes aspects of thermal and visual comfort, acoustics, air quality, etc.

as well as supporting collaboration between scheme operators to attract a higher number of municipalities.

- Developing financing strategies for capital-intensive technologies for heating and cooling (e.g. heat pumps).

b) Peer to peer learning for public authorities - step up public authorities' capacity to help deliver the energy transition – open in 2016/2017

Support will be provided to facilitating organisations which are identifying the peer-learning potential and facilitating in-depth exchange across Europe. Facilitating organisation consortia will involve the Local and Regional Energy Agencies and other relevant actors and will be in charge of i) developing and implementing a transparent and effective identification and matching process, based on evident needs and mutual benefits of potential participant as well as on successful sustainable energy projects and measures; ii) assessing the replication potential and delivering a replication plan (peer-learning plan) including documenting the results and impacts in an easily accessible format for wider application; iii) organising the peer-learning exchanges; iv) defining the learning objectives and expected impacts and; v) proactively disseminating and ensuring further replication of results (e.g. replication strategy) beyond the participating public authorities and Member States.

Proposals should provide indicative cost data structure for the set-up, facilitation and running of the exchange programmes including the specific cost per exchange.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The proposed actions are expected to demonstrate the impacts listed below:

- Primary energy savings, renewable energy production and investments in sustainable energy triggered in the territory of participating parties by the project within its duration (respectively in GWh/year and million Euro of investments per million Euro of EU funding); (for a & b)
- Number of integrated plans, vertically and or horizontally (for a)
- Number of certified municipalities (for a)
- Number of consumers/stakeholders engaged with their Public Authority (for a)
- Policies and strategies created/adapted to include sustainable energy issues at all governance levels (to be measured in Number of citations / statements from governance bodies) (for a)

- Public authorities with increased skills/capability/competencies on energy issues (to be measured in number of people with increased capacity) (for b)
- Policies and strategies created/adapted (to be measured in number of newly institutionalised energy policies and/or plans in learning public authorities) (for b)
- Number of relationships established between public authorities (for b).

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

3. BUILDINGS

The EU's energy policy has set ambitious objectives for 2020: a 20% improvement in energy efficiency, a 20% share of energy from renewable sources, and a 20% cut in CO₂ emissions compared with 1990. For 2030 the objectives are even more ambitious: a 27% improvement in energy efficiency (to be reviewed), a 30% share of energy from renewables and a 40% cut in CO₂ emissions.

Buildings contribute 40% of the EU's final energy demand and offer a large untapped potential for energy savings, therefore buildings have an important role to play in achieving these goals.

The most challenging aspect of reducing energy use in buildings is in increasing the rate, quality and effectiveness of building renovation, since the current rate of renovation is only 1.2% per year. In order to meet this challenge it is necessary to reduce renovation costs as well as reducing time spent on site, which in turn minimises disturbance of occupants. Effective solutions need to be widely demonstrated and replicated in order to help increase the renovation rate to 2-3% per year. The challenge is not limited to renovation, however. Barriers such as cost, integration of renewable energy sources, and inadequate construction skills also hamper the development of new Nearly Zero Energy Buildings (NZEB). In addition, increasingly sophisticated building control, automation and monitoring systems require more interoperability and effective integration with energy grids. Therefore this sub-area will also focus on integration of demand response in energy management systems while ensuring interoperability.

The Energy Efficiency Directive³⁸ (EED) and the recast of the Energy Performance Building Directive³⁹ (EPBD) both contain provisions to increase renovation rates. However, a number of non-technological barriers hamper the implementation of these provisions in the public

³⁸ 2012/27/EU (Energy Efficiency Directive) <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1399375464230&uri=CELEX:32012L0027>

³⁹ 2010/31/EU (Energy Performance of Buildings Directive) <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0031&from=EN>

sector and prevent market actors in the residential and private sectors from following the example that the public sector is expected to set. Market barriers also hinder the implementation of the Renewable Energy Sources Directive⁴⁰ and its obligation to set minimum requirements for renewable energy use in new buildings and in existing buildings that are subject to major renovation work. In addition, the development and roll-out of appropriate certification and accreditation schemes to continuously improve knowledge and skills of the building workforce needs specific attention.

This Energy Efficiency call complements the call of the PPP on Energy-efficient Buildings (EeB) with both technological and non-technology related topics. It focuses on the removal of existing barriers through market uptake measures in order to build capacity, to provide support for sustainable energy policy implementation and to foster uptake of technologies that are relevant to energy efficiency in buildings.

Proposals are invited against the following topic(s):

EE-10-2016: Supporting accelerated and cost-effective deep renovation of buildings through Public Private Partnership (EeB PPP)

Specific Challenge: Too much of Europe's building stock is inefficient in terms of energy use, with excessive heat losses through building envelopes and technical building systems. In addition, buildings need to contribute a greater share of renewable energy production. Too few buildings are undergoing deep renovation (whereby energy savings exceed 60% compared to pre-renovation levels) and such renovations are often too expensive. There is a need to demonstrate more cost-effective and practical ways of achieving deep renovation while reducing the time needed to renovate a building and at the same time promoting a holistic optimized approach that goes beyond the results of European and national projects, and the IEA report on Prefabricated Systems for Low Energy Renovation of Residential Buildings.

Scope: Proposals should demonstrate and promote innovative processes leading in practice to more cost-effective, higher quality, holistic and faster deep renovation of buildings with less disturbance of the residents. Proposals should demonstrate the contribution to an increased rate of renovation in a specific district/city/region. The building renovations may use pre-fabricated mass manufactured components or "plug and play" energy and ventilation systems, including innovations needed during the on-site phase. Proposals should consider innovative integrated packages of commercially available technologies. This typically includes actions on the building envelope and on the technical building systems both including renewable energy sources and conversion and storage technologies, in order to achieve very high energy performance. The proposals could include specific solutions for historic buildings, when applicable. Means of sharing technical information on the building over its whole life cycle

⁴⁰ 2009/28/EC (Directive on the promotion of the use of energy from renewable sources! <http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028>

could also be considered⁴¹. Proposals should ensure that the solutions guarantee high indoor environmental quality (thermal and visual comfort, acoustics, air quality, etc.). If necessary proposals should include smart controls to allow integration with the energy grid. Embodied energy and the possibility of reusing and recycling materials at the end of a building's life are highly relevant to the building's overall life cycle, therefore these aspects should also be taken into account.

Solutions should demonstrate the integration potential of innovative processes and explore how they could facilitate renovation. Proposals could make use of geo-clusters⁴² to respond to specific needs and to demonstrate the potential for replication.

Synergies may be considered with activities initiated under the topic LCE-17-2017.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

This topic will be implemented under the PPP on Energy-efficient Buildings. The activities are expected to be implemented at Technology Readiness Level (TRL) 6-8 (please see part G of the General Annexes). Proposers should note that this topic is also complemented by other topics relating to deep renovation, including in the PPP on Energy Efficient Buildings.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Net primary energy use reduced by 60% compared to pre-renovation levels;
- Cost reduction of at least 15% compared with a typical renovation (i.e. a renovation that meets current minimum requirements of existing building regulations⁴³);
- Demonstration of the effectiveness of the proposed solutions to reach an increased rate of renovation of a defined building typology in a specific district/city/region.
- Reduction in time needed for renovation by a factor of 2 at least compared to typical present day renovation.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

⁴¹ The use of BIM (Building Information Modelling) for documenting and sharing technical information on the building over its whole life cycle.

⁴² Geo-cluster is understood as a group of districts, cities, regions or large areas of the EU (may be even covering several MS) with similar characteristics, e.g. climate, building typology, technology, market barriers, etc.

⁴³ Definition of typical renovation is based on each country's implementation of Art. 4 of the EPBD

EE-11-2016-2017: Overcoming market barriers and promoting deep renovation of buildings

Specific Challenge: In order to achieve the EU 2020 energy efficiency objectives, the renovation rate needs to increase from the present level of 1.2% per annum to at least 2-3% (with a specific target for the public sector of 3%) and the energy performance of renovations needs to improve. Both the Energy Performance in Buildings Directive (EPBD) and the Energy Efficiency Directive (EED) contain several provisions in this respect. The environmental sustainability of renovation process but more importantly, the health and wellbeing of the occupants are also relevant. This might lead to consideration of aspects partially covered by different pieces of EU legislation such as REACH, the Water Framework Directive⁴⁴, the Construction Products Regulation⁴⁵, etc.

Many barriers, which are not necessarily technological, hamper the implementation of these provisions. For example: diversity and fragmentation within the building value chain; inefficient and complex renovation processes; a lack of deep renovation packages; low development and uptake of financial packages or incentives (e.g. grants, credits); unclear energy or environmental requirements in renovation grants or procurement processes; low progress in performance guarantees. There is therefore, a need to overcome these regulatory and non-regulatory barriers to facilitate the renovation of existing building stocks.

Scope: The focus of submitted proposals should be aiming at overcoming market barriers to deep renovation within the value chain. Any building type may be included (public or private, residential or non-residential).

Renovations can take place at one point in time or be staged in a step-by-step approach, but in any case they should strive to achieve "deep renovation" (at least 60% energy savings compared to pre-renovation levels) or aim towards Nearly Zero Energy Buildings (NZEB) performance. Proposals might consider integration of voluntary certification schemes along with energy performance certificate, including elements of indoor quality classification for buildings.

Proposals should address at least two of the following options (list not exhaustive):

- Support to consumers or end-users
- Support the implementation of renovation road maps resulting from the EED/EPBD
- Address the gap between designed and actual energy performance; support reliable energy performance standards, quality of certification and labelling schemes, etc.
- Increase the number of deep renovations by means of :

⁴⁴ 2000/60/EC (EU Water Framework Directive) <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060>

⁴⁵ Construction Products Regulation (EU 305/2011) <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:088:0005:0043:EN:PDF>

- o Solutions that offer affordable deep renovation to a large number of individual consumers (e.g. owners or end-users) and/or
- o Targeting large groups of building units in order to take advantage of opportunities for simplification and cost reduction and the potential for further replication.
- Support the use of existing financial mechanisms, instruments and innovative business models to address market failures, in particular split incentives.

The proposals should build on previous experience, including the outcome of Intelligent Energy Europe projects.

Synergies may be considered with activities initiated under the topic LCE-17-2017.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Depending on the options chosen to address in the Scope, proposals are expected to demonstrate the impacts listed below in the participant countries (wherever possible, using quantified indicators and targets):

- Increased rate of renovation in the targeted area or sector (local, regional or national; public or private; residential; non-residential);
- Increased number of individual deep renovations (exceeding 60% energy savings compared to pre-renovation levels);
- Energy savings and renewable energy triggered through deep renovations;
- Increased compliance rate in deep renovations;
- Improved environmental sustainability of deep renovation solutions.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-12-2017: Integration of Demand Response in Energy Management Systems while ensuring interoperability through Public Private Partnership (EeB PPP)

Specific Challenge: The control, automation and monitoring tools that can be integrated into buildings are becoming more and more sophisticated. In order to guarantee energy efficient operation, building service systems need to deliver adequate control and monitoring of building energy parameters. It is essential to develop and demonstrate interoperable energy automation, control and monitoring tools for efficient heating, domestic hot water, ventilation,

cooling, lighting, shading, storage, energy generation, and other building systems while ensuring a high quality indoor environment. This includes the investigation of demand response and energy management of individual customers as well.

The challenge is to integrate demand response enabling elements into Energy Management Systems and thus create 'building – energy system interaction' towards optimising, at building level, energy consumption, production and storage considering the availability and price of energy supplied via the grid. A specific challenge is that Energy Management Systems and smart home devices are often not interoperable but are linked to a certain brand, technology and/or standard. Therefore full interoperability between grids, systems and products for seamless integration of all required components in building energy management systems is crucial.

Scope: At the building and building unit level (residential or non-residential) the focus should be on optimisation, integration and demonstration of cost effective and interoperable solutions, including testing of new technologies and systems in real life situations.

The proposed solutions shall be demonstrated for buildings which incorporate intelligent Energy Management Systems and new technologies (smart home devices). They should ensure interoperability, evolving and adapting to the operational environment (self-learning), including indoor and outdoor conditions, the availability of energy from local RES generation, the availability and price of energy from grids and local energy storage capacities. Also the possibility of clustering individual demand response services, self-generation and storage at district level should be considered. Such solutions should be effective and resilient, ensuring low operational and maintenance costs and could include functions for predictive maintenance. Solutions should be compatible and appropriately integrated with smart grids via open standards, taking into account existing standards as well as standards under development. The proposed activities should clearly involve and engage building occupants, helping them to become an interactive part of the demand response solution, as well as better managing their energy demand. Proposals should involve energy suppliers (DSOs) and industrial technology suppliers.

The topic EUB-02-2017 ("Utilities: energy management at home and in buildings") in Part 5.i Information and Communication Technologies of the Work Programme is also relevant and addresses similar challenges.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

This topic will be implemented under the PPP on Energy-efficient Buildings. The activities are expected to be implemented at Technology Readiness Level (TRL) 6-8 (please see part G of the General Annexes).

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Facilitate the deployment of solutions that would improve demand response in buildings.
- Real time optimisation of energy demand and supply integrating demand-response into intelligent building energy management systems and/or other systems.
- High replicability across the EU.
- Energy cost savings through integrated home automation solutions.
- Higher indoor environmental quality and adaptability to external conditions, leading to improved comfort and living standards, while optimising energy consumption.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-13-2016: Cost reduction of new Nearly Zero-Energy buildings

Specific Challenge: According to Article 9 of the Energy Performance Buildings Directive (EPBD), Member States shall ensure that by the end of 2020 (2018 for public buildings), all new buildings are Nearly Zero-Energy Buildings (NZEB). However, progress is slower than expected and requires the development of market ready cost reduction solutions. Cost-effective integration of renewable energy production elements into NZEB in a form that fits with the construction industry's design and procurement process is a major challenge. Widespread application and roll out of means for cost effective development of NZEB would accelerate the market. The significant cost reduction that is required to mainstream NZEB by 2018 is likely to revolve around processes rather than technologies. There is an additional need to look beyond NZEB performance with a longer term perspective. Support is also needed to ensure that end users and occupants appreciate the role they play in the building's energy performance.

Scope: Proposals should focus on reducing the cost of designing and constructing new NZEB in order to increase their market uptake. Proposals should explore how improved performance beyond the NZEB level can be reached whilst maintaining an overall focus on cost reduction.

Proposals should explore the cost-effective ways in which renewable energy generation elements can be integrated into NZEB, either on-site or nearby through district solutions. Proposals could take into account the ways in which these buildings can interact with each other at the district level. Proposals could additionally explore and monitor solutions that improve the end user's experience of these buildings, and which would contribute to greater public acceptance of the need to reduce energy consumption in buildings.

Cost reduction and energy savings should apply to the whole life-cycle of the building. This challenge addresses the whole of the construction process, including inception, planning, design, pre-fabrication, on-site operations and post-construction reviews. Proposals could address one or more aspects of the whole process.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Measurable reduction of construction-related costs compared to the current cost of a new conventional building that meets current building regulations;
- Measurable nearly zero (or beyond) energy consumption (including on-site or nearby renewable energy sources) and nearly zero impact of materials used over the whole life cycle;
- Demonstration of co-benefits which can have an impact on the real estate value of such buildings and on living/occupancy standards.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-14-2016-2017: Construction skills

Specific Challenge: In order to reach the EU's energy and climate targets, a qualified building workforce is needed. Improving the skills of middle and senior level professionals and blue collar workers in the area of sustainable energy efficient construction is therefore of key importance. This should be done throughout the entire value chain of the buildings sector. Professionals and blue collar workers also need to be aware of new upcoming challenges relating to nearly-zero energy buildings (for example new materials and, products; the integration of renewable energy sources; new systems or processes such as standardisation and common voluntary certification of buildings and use of Building Information Modelling (BIM) tools, etc.).

Scope: The focus of submitted proposals shall be on upgrading or setting up large-scale qualification and training schemes. Proposals are to address coordination and accompanying measures (e.g. voluntary certification schemes, accreditation, mutual recognition, incentives to encourage the participation of craftsmen, sustainability of the schemes, etc.). Running training actions will not be in the scope of the proposal. Proposals may also focus on setting up a mutual recognition scheme of qualifications and certifications among different Member

States. Proposals should include a strategy to ensure that qualification and training schemes are sustained after the end of the project. For financial support to trainees, proposals should link to other sources of funding available at national level such as the European Social Fund, including the Youth Guarantee Scheme.

The objective is to increase the number of skilled building professionals and/or blue collar workers across the building value chain (designers, architects, engineers, building managers, technicians, blue collar workers including apprentices, and other building professionals) with a specific focus on the engagement of SMEs. Training schemes can also consider operation and maintenance activities. Ultimately, the aim is to improve the overall quality of renovations and new constructions, to accelerate the renovation rate and to ensure proper interactions between different trades and professions. The submitted proposals need to be focused and are not necessarily required to address the whole range of professions and crafts involved in the building sector.

Proposals should take note of the BUILD UP Skills initiative, in particular the strong links with National Qualification Platforms and the implementation of the recommendations of the national qualification Roadmaps, and taking into account the European Qualifications Framework (EQF). They could also be developed with consideration to Erasmus+ actions and in particular the Sector Skills Alliances, which are focused on vocational training. Proposals should develop and roll-out appropriate certification and accreditation schemes to continuously improve knowledge and skills of the building workforce and to increase the quality of construction.

Proposals should focus on improved multidisciplinary approaches and understanding across different trades, for example using BIM, and involving Open BIM initiatives at the national level. They should also focus on improved appreciation of the end user's needs including the quality of indoor environment (thermal and visual comfort, acoustics, air quality, etc.) and improved operation and maintenance. Proposals may include the entire design chain (e.g. manufacturers) and material life cycles and embodied energy in the required skills.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below, using quantified indicators and targets wherever possible:

- Creation and implementation of sustainable qualification and training schemes for building professionals and/or blue collar workers;
- Plans for sustainability after the project's life and replication across the EU,
- Increase in the number of skilled workers (building professionals and/or blue collar workers);

- Improved collaboration and understanding across different trades and professional groups;
- Demonstrated reduction in the gap between designed and actual energy performance through improved quality of construction in specific projects;
- Measurable energy savings and/or renewable energy production resulting from improved skills;
- Improved market recognition of skills in the building sector (industry standards).

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

4. INDUSTRY, SERVICES AND PRODUCTS

The industry and service sectors represent more than 39% of the EU 's final energy consumption (Eurostat, May 2014). The need to decrease energy costs has prompted many industries to make energy efficiency improvements, particularly large energy-intensive industries (e.g. iron and steel, cement, chemicals, petrochemicals, glass and ceramics). However, opportunities for saving energy remain in most enterprises. This call aims to tackle technological and non-technological barriers faced by large companies and SMEs in order to improve their energy efficiency in the context of the audit requirements of the EED and to enhance investments. Focus is also placed on waste heat recovery, heat conversion (to power) in industry and industrial parks, building on the SPIRE roadmap and complementary to the LEIT part of Horizon 2020 and the related SPIRE calls.

This section of the Work Programme focuses also on the increase of energy efficiency of industrial parks through energy cooperation and mutualised high-quality energy services; moreover, Member States and Associated Countries are invited through ERA-NET Cofund to identify Joint Actions towards increasing energy efficiency in industry and services.

Topics relevant to this section can also be found in Part 5.i. Information and Communication Technologies of the Work Programme/ LEIT in particular topic ICT-15-2016-2017 ("Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation").

In order to respond to the expected increase of energy demand for ICT processing in the coming years, actions are needed to increase the energy efficiency, the use of renewable energy sources and integration of data centres in the energy system.

Demand driven innovation, such as public procurement of innovation, needs particular attention since the public sector constitutes an important driver for stimulating market transformation towards more sustainable and innovative energy-related products and services.

Everyday products, both domestic and industrial, have a big impact on our bills and environment. The products section of the Work Programme presents actions to increase confidence among purchasers, manufacturers and retailers by supporting and leveraging the implementation of EU product legislation. For example, Ecodesign and labelling legislation can save consumers billions of Euros and avoid vast amounts of carbon emissions. Given its importance and large potential for energy savings, it is necessary to ensure enforcement of EU product legislation.

Proposals are invited against the following topic(s):

EE-15-2017: Increasing capacities for actual implementation of energy efficiency measures in industry and services

Specific Challenge: In industrial and service sectors, energy efficiency investments, which can lead to important energy savings beneficial for the company and society as a whole, are often not implemented due to combination of factors and barriers faced by the actors involved (employees, decision-makers, auditors, ESCO, financial community etc.).

According to the Energy Efficiency Directive, large enterprises are subject to mandatory energy audits unless they are implementing an energy or environmental management system, and SMEs are encouraged to undergo energy audits within the coming years. This represents an opportunity for energy efficiency investments. However, as mentioned in the EEFIG report⁴⁶, to ensure that energy audit recommendations lead to actual implementation, it is necessary to change the approach in order to ensure that the results of energy audits provide the relevant financial data and can be addressed at board level.

Energy efficiency also relies on people behaviour and improvement of the energy culture of enterprises and their supply-chain.

Scope: Proposals should focus on one of the following topics:

- Capacity building programmes for qualified and/or accredited experts carrying out energy audits to ensure that they include the necessary financial and technical data which allows decision-makers and financiers to make informed decisions on implementing the energy saving measures identified; this could include the integration of LCCA (Life Cycle Cost Analysis) or NPV (Net Present Value) in energy audits.
- Staff trainings and capacity building programmes to enhance corporate policy towards energy efficiency, energy culture (motivations, behaviour change, mitigation of perceived risks and barriers) and sustainable supply-chain initiatives. All actors (from decision makers/corporate board members to employees in each department including purchase) should be targeted.

⁴⁶ www.eefig.com

Proposals should demonstrate how the proposed activities will be continued commercially beyond the project lifetime. Involvement of relevant multiplier organisations is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the scope of the proposal:

- Primary energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding);
- Market stakeholders with increased skills/capability/competencies (to be measured in number of people with increased capacity) and long-lasting training tools;
- Number of people/enterprises with enhanced energy culture documenting why and how changes are an effect of particular measures taken, as well in terms of the sustainability of the behavioural change.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-16-2016-2017: Effective implementation of EU product efficiency legislation

Specific Challenge: By 2020 full implementation of the EU product efficiency legislation should be one of the most important contributions to the EU energy efficiency target. The Ecodesign Directive alone should yield yearly savings of up to 600 TWh of electricity and 600 TWh of heat in 2020, as well as net savings for European consumers and businesses of €90 billion per year – 1% of EU's current GDP – in year 2020 (meaning net savings of €465 per household per year). Non-compliance with these rules is estimated to reduce these savings by at least 10%. Previous initiatives have demonstrated the usefulness of market surveillance activities. However to ensure full implementation of product efficiency legislation, these activities should be improved.

The enforcement of energy efficient products regulations should also take into account other relevant environmental impacts (e.g. emissions, noise) in order not to adversely influence peoples' quality of life.

The challenge is thus to:

- improve market surveillance activities.

Scope: Provide support for joint surveillance actions that focus on building up the monitoring, verification and enforcement of the EU's energy-related products policy, in particular for those products that represent the highest energy saving potential (e.g. electric motors, water and space heating and cooling equipment, lighting) or those newly regulated products that represent new challenges for market surveillance because of the size and complexity of the products (e.g. power transformers, professional refrigerating and freezing equipment, large industrial products).

Proposals should focus on building up the monitoring, verification and enforcement of the EU's energy-related products policy, in particular for those products that represent the highest energy saving potential and with lower compliance rates or those regulated products that represent new challenges for market surveillance and therefore may require new approaches and methods for monitoring, verification and enforcement. Proposals should support higher level of surveillance activities and go beyond product testing. They should not replace activities that are under the responsibility of Member States, but should add European value to them (e.g. execution of joint activities, exchange of information, development of common methods, protocols or checklists, etc.). Actions must include the relevant market surveillance authorities⁴⁷ at least one per participating country, in their consortia. Actions should also involve consumers' (or other end users') associations as appropriate, and demonstrate a high transnational added value. Actions should take stock of previous EU-funded work on monitoring, verification and enforcement, combining and leveraging relevant results to a much wider audience across the EU.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the scope of the proposal:

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding) corresponding to the energy losses avoided from non-compliance;
- Increase of confidence among purchasers, manufacturers and retailers;
- Contribution to the enforcement of EU product legislation.

Type of Action: Coordination and support action

⁴⁷ The market surveillance authorities are the authorities of the Member States responsible for enforcement of ecodesign, energy labelling and labelling of tyres regulations, appointed in accordance with Regulation (EC) No 765/2008 of the European Parliament and the Council

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-17-2016-2017: Valorisation of waste heat in industrial systems (SPIRE PPP)

Specific Challenge: Energy and fuels represent between 20% and 40% of the production costs in several Resource and Energy Intensive Industries (REII). A lot of technical progresses were already done in REII to reduce the energy consumption of the main industrial products. Nevertheless, significant parts of the input-energy are still lost in the form of waste heat by gas, liquid or solid streams.

Those losses occur because either the corresponding energy losses are difficult to recover and re-use in the process itself or in another part of the production process or the required equipment are too costly (low ROI).

The challenge is to design, build, test & demonstrate new processes/components or innovative adaptation of existing solutions for waste energy recovery in large industrial systems.

Furthermore, sources of energy losses that are considered as a waste for a given industry could be a valuable resource for another one, directly or after an intermediate transformation step. By reusing waste and residual heat in a more efficient way primary energy can be saved. This topic responds to the needs of the process industry identified in the roadmap of the SPIRE cPPP (Sustainable Process Industry through Resource and Energy Efficiency contractual Public-Private Partnership).

Scope: Actions should improve the energy efficiency of large industrial systems by designing economic industrial solutions based on innovative technologies for recovery of waste heat or the innovative adaptation of already existing solutions for waste heat recovery. Actions should address the recovery of waste heat from streams from industrial processes (e.g. waste streams, by-products, intermediates) or from surplus heat in plant parameters to transform it in useful energy forms, including the production of technical gases (e.g. oxygen, hydrogen) to be used in the industrial process itself or exported as by-products. Solutions should be adaptable to various types of industrial processes and should be validated by full scale demonstration in real production conditions in industrial facilities.

Actions could either propose innovative technologies for the efficient recovery of waste heat in large industrial systems or innovative solutions of energy symbiosis between industries or plants inside industrial parks for the valorisation of waste and residual heat.

For actions proposing innovative technologies for waste heat recovery in large industrial systems one or more of the following technological issues should be addressed:

- The intermittent character of the recoverable energy flows and its variations during normal operating conditions e.g. adapted storage to smooth these variations (such as low materials cost with high thermal inertia, Phase Change Materials, commodities storage, etc.);

- Achieving safe, controlled and efficient recovery of heat from media, which are very difficult to handle and control (high temperature, high volumes, highly aggressive-fouling/deposits/corrosion);
- The transfer of energy flows from a process line to the other one, and investigating the potential use of recovered energy in other processes with various heat transfer media (water/steam, oil, salts, gases....);
- The influences of the new heat recovery process on the product quality (e.g. dry cooling instead of wet cooling);

Actions proposing innovative solutions of energy symbiosis between industries or plants inside large industrial parks for the valorisation of waste and residual heat should cover, if possible, all the following points:

- To analyse, characterise and assess the sources of energy losses in the spirit of reusing them in other plants or industries (e.g. amount, composition, temperature, impurity and fluctuation have to be taken into account, improving the global environmental impact, and new measurements and models could be needed to identify them) and to identify the relevant heat and energy demands;
- To determine and demonstrate flexible solutions to coordinate the sources and demands and to optimise the energy fluxes between the different plants and industries. Interactions between the industrial site and the surroundings should be taken into account as an additional opportunity for valorisation of waste/residual heat. New management systems for the energy loss fluxes have to be developed;
- To determine and demonstrate innovative storage technologies and strategies to harmonize energy use for fluctuating inputs (e.g. wind, converter gas) and variable (batch) process demands and to exploit the variations of the hourly electricity price;
- To determine and demonstrate innovative conversion technologies and strategies to improve the accordance of demands and sources of energy;
- To define the most suitable energy carriers to be implemented in a laboratory scale at the proper scale in the environment representative of industrial application laboratory scale.

New management systems for the energy loss fluxes have to be developed basing on the parameters and models described above.

The activities are expected to be implemented at TRL 5-7.

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 and 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below, using quantified indicators and targets, wherever possible.

For actions proposing innovative technologies for waste heat recovery in large industrial systems:

- Recovery of at least 40% of the sensible heat contained in each waste heat carrier addressed by the project.
- Measureable substantial primary energy savings clearly quantified and substantiated, and subsequent reduction of CO₂ emissions
- The improvement of the energy efficiency and the reduction of energy cost will lead to a demonstrated advancement in competitiveness by the end of the project. This will expand the available portfolio of energy resources and technologies, which can be integrated within sites, across sectors and along value chains.

For actions proposing innovative solutions of energy symbiosis between industries or plants inside large industrial parks for the valorisation of waste and residual heat:

- Recovery of at least 40% of waste/residual heat.
- Measureable substantial primary energy savings, clearly quantified and substantiated, and subsequent reduction of CO₂ emissions.
- Cost-saving optimizations of energy and resources supply and demand by taking into consideration both economical and sustainability constraints.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-18-2017: Energy efficiency of industrial parks through energy cooperation and mutualised energy services

Specific Challenge: Energy represents an important part of enterprises' production costs even for non-energy intensive industries, and the availability of affordable, easy to access, energy services is one of the key business development enabler and competitiveness factor. Industrial parks play an important role in the European economy and the improvement of their energy efficiency is the main challenge of this topic. Optimising their energy efficiency can be obtained by stimulating and facilitating energy cooperation among businesses. Such cooperation can be done via clustering buildings and processes, by energy exchange, collective production and joint contracting of mutualised energy services. However, there are a number of barriers that hinder the development of energy cooperation of neighbouring businesses. These barriers are mostly organisational, financial, legal, social and technical.

The use of joint contracting of mutualised energy services is a promising model for industrial parks, especially when businesses are not energy intensive and when they don't have the time, expertise and financial resources to develop such energy cooperation. In that sense, energy services companies have a role to play in providing businesses with high-value services in the form of e.g. heating, electricity, cooling, to master a modern, environmentally friendly, renewable based and energy efficient system in industrial parks relying on the latest technologies and solutions (e.g. highly efficient, renewable and waste/residual recovery based systems, demand response, energy cascades).

Scope: Proposals should improve the energy efficiency of industrial parks (or neighbouring businesses) by unlocking the market potential for energy cooperation and by supporting the demand and offer of mutualised high-quality energy services.

Proposals should address at least one of the following aspects:

- implementation of energy cooperation between businesses: develop and test instruments facilitating the actual implementation of energy cooperation between businesses (e.g., setting appropriate process and business organisation, operation and plant design, cooperation mechanisms, related contractual and financial arrangements, better planning of industrial parks, good practices, etc.). Proposals should include related capacity building issues: increasing the skills and engagement of companies, via e.g. their CEOs and CFOs, energy managers and other related stakeholders to identify and accelerate the development of energy cooperation;
- implementation of joint energy services: develop and test replicable business models and service concepts for joint energy services provided by ESCO or other relevant third party (e.g. identification of horizontal energy services attractive for businesses, identification of the most relevant innovative technical solutions, setting contractual and financial arrangements, good practices to engage companies in mutualised energy services, cost-calculation and cost-reduction models, etc.). Proposals should include related capacity building issues in order to increase the skills, know-how and specific expertise of ESCOs or other relevant third party to boost the market for joint contracting energy services in industrial parks.

Proposals should address legal issues in order to adapt regulatory and legal frameworks at the local, regional and national context. Proposals should also have a cross-cutting perspective and a strong communication and dissemination component to reach as many industries, industrial parks manager and ESCOs as possible and to break the industrial cultural perception of mutualised energy services and energy cooperation.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the scope of the proposal:

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Deployment of replicable energy concept with the goal to increase the competitiveness of enterprises;
- Deployment of replicable business models and market offer for joint contracting energy services for industrial parks;
- Number of companies/ESCOs/energy managers and other market stakeholders with increased skills/capability/competencies (to be measured in number of people with increased capacity);
- Policies and legal frameworks created/adapted to facilitate energy cooperation among businesses at all governance levels (to be measured in Number of citations / statements from governance bodies).

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-19-2017: Public Procurement of Innovative Solutions for energy efficiency

Specific Challenge: Considering the large volume of public spending (19% of EU GDP, or roughly EUR 2,200 billion in 2009), the public sector constitute an important driver to stimulate market transformation towards more sustainable energy-related products and services. The Energy Efficiency Directive requires that central governments purchase only products, services and buildings with high energy-efficiency performance. Public Procurement of Innovative solutions (PPI) is not sufficiently developed in the field of energy efficiency although it could support the market up-take of energy efficient goods, buildings or services.

Scope: Actions enabling local authorities to undertake one joint PPI procurement of innovative solutions for buildings (NZEB, renovation), products or services, which are not yet available on a large-scale commercial basis, and which have energy performance levels that are better than the best levels available on the market. This should result in one joint PPI call for tender launched by the lead procurer and one joint evaluation of offers. Actions should deploy commercial volumes of the innovative solution, in order to assure its market uptake. Functional/performance based specifications should be ambitious but achievable without the procurement of research and development and without distorting competition. Where appropriate, proposals should build upon the outputs of ongoing projects (including the

Project Development Assistance projects), networks, guides, tools, and rely on the use of cost – benefit analysis (e.g. using a life- cycle approach). Proposals should actively use the Procurement of Innovation Platform supported by the European Commission. The procurement of innovation process should be associated with coordination and networking activities that embed the PPI into a wider set of demand side activities, including the removal of marked barriers (e.g. lack of knowledge, practical training, tailored guidelines and legal uncertainties) and awareness and knowledge sharing activities. Actions should involve large multipliers such as central purchasing organizations.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. The funding rate for Public Procurement of Innovative Solutions (PPI) actions is limited to 35% of the total eligible costs (PPI is procurement for the purchase and deployment of innovative solutions) to leverage co-financing from the procurers.

Expected Impact: For PPI actions, proposals are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets):

- Exploitation strategy, assuring the deployment of commercial volumes of the innovative solution and their wide diffusion and a dissemination strategy assuring that the results of the action reach considerable numbers of relevant stakeholders.
- Energy performance levels of new buildings should be at least 25% better than current regulations or reach NZEB performance levels. For existing buildings, energy savings of at least 60% compared to the existing building should be reached, using innovative solutions. Products and services, should demonstrate at least 25% better performance in terms of energy efficiency than best available solutions on the market.

Type of Action: Public Procurement of Innovative solutions

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-20-2017: Bringing to market more energy efficient and integrated data centres

Specific Challenge: Following the increasing demand for cloud computing, big data, Internet of Things, dematerialization of documents and other ICT services, the demand for ICT processing is expected to grow exponentially in the coming years. Data centres should become more energy efficient and should maximise integration of renewable energy sources. Intermittent renewable energy sources need to be combined with energy storage (electricity or cold/heat) to ensure efficient and secure energy management in data centres. In addition, existing and new data centres should be better integrated into the various energy grids (electricity and/or heat) in order to turn their energy use and waste into a benefit for the whole energy system. Previous research activities in this area have identified a wide array of innovative solutions and concepts. However, further research and development activities are

needed to bring them to the market. Speeding up the time-to-market of these promising solutions is the main challenge under this topic.

Scope: Innovation Actions are needed to increase the energy efficiency, the use of renewable energy sources and integration of data centres in the energy system. Proposals should cover several following areas: innovative and energy efficient cooling solutions, waste heat reuse, geographical and temporal workload balance, integration of local and remote renewable energy sources, integration in smart grids, integration with district heating/cooling networks, integration of power backup system in the grid and use of heat pumps for efficient use of waste heat etc. Proposals should include the development of business models to trade heat, cold, electricity or energy security and storage. Proposals should build upon the results of previous projects such as the ones funded under the FP7-Smartcities Call 2013 (namely RenewIT, DC4Cities, Dolfin, Genic, GreenDataNet, GEYSER). Proposals should focus on new and existing data centres (indicatively from 500 kW to 1 MW IT load).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 3 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets):

- Bring data centre specific innovative energy efficiency technologies and solutions, already developed by research projects, to market faster and cheaper.
- Reaching a Power Usage Effectiveness⁴⁸ of up to 1.2.
- Achieve a high share of the data centre energy consumption covered by sustainable energy resources.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-21-2016: ERA-NET Cofund actions supporting Joint Actions towards increasing energy efficiency in industry and services

Specific Challenge: The challenge for the European industry is to develop a global technological leadership in energy efficiency solutions. The EU-funding alone will not be sufficient to ensure an increase in energy efficiency in the process industry by 20% in 2020 and to radically reduce the energy content of production, leading to more flexible, less costly manufacturing processes and for self-consumption. Therefore the Member States and

⁴⁸ Power usage effectiveness (PUE) is a measure of how efficiently a computer data centre uses energy; PUE=total facility energy/IT equipment energy

Associated Countries are invited through this action to identify Joint Actions in this field, to implement joint activities, and to systemically address the non-technology barriers for wider uptake of energy efficiency.

Scope: The proposed ERA-NET action aims at development and launch of a joint call for proposals in the field of energy efficiency in Industry and Services. Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. The joint call should focus around a limited number of industrial sectors, not covered under SPIRE. The projects financed by the joint call should cover either industrial sectors with very energy intensive industrial processes or industrial sectors with large energy consumption due to their market presence, though their industrial processes are not highly energy intensive. Further, they should cover industrial sectors with innovative potential and willingness/readiness to implement energy efficiency measures at a meaningful scale. Finally, the size of the addressed industrial sectors in EU and/or their benefits for the EU economy need to be taken into account. The joint call should address Innovation Actions and include the elements related to persistent market barriers. Proposals should demonstrate how the proposed activities will be continued commercially beyond the project lifetime. Involvement of relevant multiplier organisations is encouraged. The ERA-NET action will be implemented according to the three reporting periods scheme.

The Commission considers that proposals requesting a contribution from the EU of around EUR 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The ERA-NET action will indicate the specific impact resulting from the transnational nature of the action and the European added value. Deliverables of each of the projects financed by the joint call will be included in the reports of the ERA-NET action to the European Commission. The projects financed by the joint call are expected to demonstrate the impacts in terms of primary energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding). They are also expected to contribute to the objectives of the EU Energy Efficiency policies and initiatives. Finally, they will include ad-hoc indicators to measure the progress against specific objectives of their choice, which could be used to assess the progress during the ERA-NET action life time.

Type of Action: ERA-NET Cofund

The conditions related to this topic are provided at the end of this call and in the General Annexes.

5. INNOVATIVE FINANCING FOR ENERGY EFFICIENCY INVESTMENTS

Despite growing investment in energy efficiency, there is still a gap between the financial sector and energy efficiency projects, e.g. due to a lack of mutual understanding and well

established means of interaction. The absence of a proven track record of energy efficiency investments, and a pipeline of concrete projects, are major obstacles to the supply of large-scale finance at a low cost for energy efficiency. This challenge is addressed: 1) at the project level by provision of Project Development Assistance support under the topic EE22 and Elena Facility and 2) at the programme level (regional or national) by supporting the development of innovative financing schemes and initiatives leading to better "readability" of the market fundamentals for financiers and investors 3) at the EU level by addressing issues related to scalability, aggregation and risk consideration related to energy efficiency investments from a global, financial perspective creating the legal and organisational arrangements which will allow an enhanced flow of private finance. Finally, energy efficiency services such as energy performance contracting need to be further developed and extended to new types of actors and sectors.

Proposals are invited against the following topic(s):

EE-22-2016-2017: Project Development Assistance

Specific Challenge: As underlined in the Investment Plan for Europe, there is continued need for building a solid and transparent pipeline of sustainable energy investment projects to help the EU unlock additional investments and in order to demonstrate their financial viability and attractiveness, in particular, to private investors. Whilst there is already a significant pipeline of large scale renewable energy projects, investors and lenders need to gain more confidence on investment projects related to energy efficiency which are still seen as risky and fragmented. EU added value can be obtained in particular where projects introduce innovation to the market regarding project aggregation and financing solutions minimising transaction costs and engaging the private finance community as well as where projects demonstrably remove legal, administrative and other market barriers for mainstreaming large scale sustainable energy investment schemes.

Scope: Project Development Assistance (PDA) will be provided to public and private project promoters such as public authorities or their groupings, public/private infrastructure operators and bodies, energy service companies, retail chains, estate managers and services/industry. The aim of the action is thus to build technical, economic and legal expertise needed for the project development and leading to the launch of concrete investments.

The proposed investments will be launched before the end of the action which means that the project should result in signed contracts (or launched tendering procedures as appropriate) for sustainable energy investments to that effect, e.g. construction works, energy performance contracts, turnkey contracts.

The PDA focusses on sectors of existing public and private buildings; street lighting; retrofitting of existing district heating/ cooling; energy efficiency in urban transport (such as transport fleets, the logistics chain, e-mobility, modal change and shift) in urban/sub-urban agglomerations and other densely populated areas and energy efficiency in industry and services.

Whilst proposals may address investments into distributed, small-scale renewable energy sources in combination with energy efficiency, the main focus should lie on capturing untapped high energy efficiency potentials.

Proposals should have an exemplary/showcase dimension in their ambition to reduce energy consumption and/or in the size of the expected investments. Proposals should also deliver organisational innovation in the financial engineering (e.g. on-bill financing schemes, guarantee funds, or factoring funds) and/or in the mobilisation of the investment programme (e.g. bundling, pooling or stakeholder engagement). Innovation should be demonstrated taking into account the state-of-the-art. In addition, proposals should demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results towards potential replicators across the EU.

This PDA facility focuses on small and medium-sized energy investments of at least EUR 7.5 million to EUR 50 million⁴⁹.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets):

- Delivery of a series of sustainable energy investment projects and innovative financing solutions schemes;
- Every million Euro of Horizon 2020 support should trigger investments worth at least EUR 15 million.
- Primary energy savings, renewable energy production and investments in sustainable energy triggered in the territory of participating parties by the project within its duration (respectively in GWh/year and million Euro of investments per million Euro of EU funding),
- Demonstration of innovative and replicable investment financing solutions, documenting feedback/uptake from potential replicators.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

⁴⁹ It is complemented by the ELENA facility which provides project development assistance for larger scale investments.

EE-23-2017: Innovative financing schemes

Specific Challenge: There is a need to set up innovative financing schemes at regional or national level in order to create the conditions for adequate supply of private finance for energy efficiency investments. New financing schemes can therefore play an important role in supporting the effective implementation of the Investment plan for Europe and the effective use of European Structural and Investments Funds (ESIF). This requires among others setting up the legal and technical arrangements between the key actors on a given territory, agreeing on common procedures for qualifying projects and financing them, setting up templates for technical specifications and contracts, etc. However, the development of new financing schemes should always be based on the principles of complementarity and additionality, as well as transparency and due diligence and reflect the fundamentals of the given territory or market segment.

Innovative financing schemes can involve different types of organisations and ownership structures and include for example replication of previously demonstrated successful financing models such as dedicated credit lines, guarantee facilities, on-bill financing schemes (e.g. utility-financed), or factoring/forfeiting schemes; on-bill or on-tax financing schemes citizen financing (e.g. crowd-funding) for energy efficiency; finance models for the deep renovation of buildings, addressing both property and rental markets; or schemes based on project aggregators or clearing houses at regional or national level, which should support project development and match demand and supply of energy efficiency finance.

The large-scale roll-out of innovative financing schemes may also require overcoming a number of obstacles such as the lack of competences, in particular for public authorities, as well as the legal and policy framework at national and EU levels in order to support the implementation of effective and sustainable energy systems and value chains.

Scope: Proposals should address development or replication of innovative financing schemes including various forms of on-bill financing (e.g. utility-financed). Exploring possible avenues of supporting energy efficiency financing by innovating the framework and instruments that could be further up-scaled e.g. under the European cohesion policy or other schemes. Analyse impacts of existing financial instruments and requirements for up-scaling. Proposals should include capacity building on innovative financing to specific groups of stakeholders such as Member States, public authorities, energy agencies, energy consultants, and the financial sector, led by or involving professional federations or associations at the national level as appropriate. Capacity building could use the concrete examples developed through project development facilities (e.g. ELENA, MLEI PDA). Training tools should be complementary to already existing/recognised training schemes for the targeted groups, and demonstrate sustainability.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the activities of the proposal:

- Delivery of innovative financing schemes that are operational and ready to finance energy efficiency investments.
- Market stakeholders with increased skills/capability/competencies (to be measured in Number of people with increased capacity) and long-lasting training tools.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-24-2016-2017: Making the energy efficiency market investible

Specific Challenge: Sub-optimal levels of investment in sustainable energy (in particular energy efficiency) are linked, among others, to a lack of trust of investors and financiers in the financial viability of energy efficiency measures. Banks, institutional investors and asset managers lack the skills and operational tools to effectively assess sustainable energy investments and integrate energy efficiency in their investment strategies. Access to the capital markets for energy efficiency investments is hampered by the lack of standardisation of assets.

Scope: Proposals should address one or more of the following issues:

- Development, demonstration and promotion of frameworks for the standardisation and benchmarking of energy efficiency investments such as labelling schemes, project rating methodologies and risk assessment tools, standardised legal and financial structures of assets (loans, guarantees, energy performance contracts etc.) in order to develop securitisation and rating models for energy efficiency based financial products, which should enable the development of and access to secondary markets. Proposals integrated in a broader approach such as socially responsible investment should focus on the energy component.
- Gathering, processing and disclosing large-scale data on actual financial performance of energy efficiency investments, in order to create a track record for energy efficiency in different sectors (buildings, industry, transport, etc.). Further integrating the 'green value' of buildings in property valuation through collection of market data across the EU and actions targeted to the key actors in the sale or lease process (e.g. real estate agents, property valuers, notaries, etc.)
- Targeting institutional investors (e.g. public pension schemes) in order to increase the share of their funds invested in energy efficiency, or to develop specific funds or investment products. Supporting the integration of energy efficiency in portfolio

management strategies for institutional investors and/or fund managers, including through re-definition of fiduciary duties.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 1.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets), depending on the activities of the proposal:

- Reduced uncertainty as regards investments into energy efficiency and increased investors' confidence;
- Frameworks, standardisation, benchmarking, standardised descriptions and data evidence of financial returns of energy efficiency investments agreed and accepted by the market;
- Higher allocation of institutional investments to energy efficiency; standardisation of assets enabling securitisation; development of a secondary market for energy efficiency assets.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

EE-25-2016: Development and roll-out of innovative energy efficiency services

Specific Challenge: As underlined in the Investment plan for Europe, significant investments are needed in the scale of around EUR 100 billion per year⁵⁰ in order to meet the 2020 and 2030 energy efficiency targets of the European Union. While the EU Structural and Investment Funds and national support schemes can contribute to some extent with public finance, most of the financing needs to come from the private sector. The Energy Efficiency Market Report by the International Energy Agency⁵¹ confirms that energy efficiency is becoming an established financial market segment, energy efficiency finance is expanding and innovating, with new funding approaches and business models, and the market potential for energy efficiency is growing significantly. However, in order to reach more quickly the full market potential, the development and large-scale uptake of new business models and energy efficiency services such as Energy Performance Contracting combined with innovative financing solutions are needed to better monetise the future energy savings for the initial investments.

⁵⁰ Estimation based on the Impact Assessment of the Energy Efficiency Communication, SWD (2014) 255 final.

⁵¹ International Energy Agency (2014). Energy Efficiency Market Report 2014. Paris.

Scope: Proposals aiming at developing, demonstrating and standardising new types of energy efficiency services and business models in all sectors (incl. mobility), which could better monetise the multiple benefits of energy efficiency⁵².

Supporting the further development of energy performance contracting or similar methods based on monetisation of energy savings and other benefits by new types of actors (e.g. industry, facility managers, construction companies, social housing operators, or other actors) and/or in new market segments (e.g. residential sector).

Support the development of innovative energy efficiency services and business models for industrial and service companies enhancing the implementation of energy audit recommendations. Special focus should be placed on the implementation of energy efficiency measures in industries and companies that use large shares of thermal demand (e.g. hotels, leisure centres, retail, hospitals) in order to accelerate the uptake of energy efficient and renewable heating and cooling solutions.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 million and EUR 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposed actions are expected to demonstrate the impacts listed below (wherever possible, use quantified indicators and targets):

- Viability of innovative energy efficiency services.
- Investments in sustainable energy made by stakeholders in sustainable energy while employing innovative financing schemes based on energy services (in million Euro of investments per million Euro of EU funding)
- Primary energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding)
- Renewable Energy production triggered by the project within its duration (in GWh/year per million Euro of EU funding)

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

⁵² International Energy Agency (2014), Capturing The Multiple Benefits of Energy Efficiency

Conditions for the Call - Energy Efficiency Call 2016-2017

Opening date(s), deadline(s), indicative budget(s):⁵³

Topics (Type of Action)	Budgets (EUR million)		Deadlines
	2016	2017	
Opening: 15 Oct 2015			
EE-10-2016 (IA) EE-17-2016-2017 (IA)	16.00		21 Jan 2016
EE-03-2016 (IA) EE-04-2016-2017 (RIA) EE-05-2016 (RIA) EE-07-2016-2017 (IA) EE-08-2016 (RIA)	34.00		21 Jan 2016
Opening: 15 Mar 2016			
EE-06-2016-2017 (CSA) EE-09-2016-2017 (CSA) EE-11-2016-2017 (CSA) EE-13-2016 (CSA) EE-14-2016-2017 (CSA)	30.00		15 Sep 2016

⁵³ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

All deadlines are at 17.00.00 Brussels local time.

The Director-General responsible may delay the deadline(s) by up to two months.

The deadline(s) in 2017 are indicative and subject to a separate financing decision for 2017.

The budget amounts for the 2016 budget are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget 2016 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2017 budget are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017.

HORIZON 2020 - Work Programme 2016 - 2017
'Secure, Clean and Efficient Energy'

EE-16-2016-2017 (CSA)			
EE-24-2016-2017 (CSA)			
EE-25-2016 (CSA)			
EE-22-2016-2017 (CSA)	8.00		
EE-21-2016 (ERA-NET-Cofund)	5.00		15 Sep 2016
Opening: 15 Jun 2016			
EE-12-2017 (IA)		16.00	19 Jan 2017
EE-17-2016-2017 (IA)			
EE-01-2017 (IA)		30.00	19 Jan 2017
EE-04-2016-2017 (RIA)			
EE-07-2016-2017 (IA)			
EE-20-2017 (IA)			
Opening: 19 Jan 2017			
EE-02-2017 (CSA)		47.00	07 Jun 2017
EE-06-2016-2017 (CSA)			
EE-09-2016-2017 (CSA)			
EE-11-2016-2017 (CSA)			
EE-14-2016-2017 (CSA)			
EE-15-2017 (CSA)			
EE-16-2016-2017 (CSA)			
EE-18-2017 (CSA)			
EE-19-2017 (PPI)			
EE-23-2017 (CSA)			
EE-24-2016-2017 (CSA)			

HORIZON 2020 - Work Programme 2016 - 2017
'Secure, Clean and Efficient Energy'

EE-22-2016-2017 (CSA)		8.00	
Overall indicative budget	93.00	101.00	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

Exceptional funding rates:

EE-19-2017	The funding rate for Public Procurement of Innovative Solutions (PPI) actions is limited to 35% of the total eligible costs (PPI is procurement for the purchase and deployment of innovative solutions) to leverage co-financing from the procurers.
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Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme with the following exceptions:

EE-02-2017, EE-06-2016-2017, EE-09-2016-2017, EE-11-2016-2017, EE-13-2016, EE-15-2017, EE-18-2017, EE-23-2017, EE-24-2016-2017, EE-25-2016	<p>Taking into account the nature of the activity and with the objective to maximize the European Added Value and European market uptake through transnational collaboration*, the following additional eligibility criteria apply:</p> <ol style="list-style-type: none"> 1. at least three legal entities shall participate in an action; 2. each of the three legal entities shall be established in a different Member State or Associated Country 3. all three legal entities shall be independent of each other within the meaning of Article 8 of the Rules for Participation. <p>* Transition towards Secure, Clean and Efficient Energy and the Energy Union project are cross-national policy initiatives and priorities aiming at trans-national solutions.</p>
EE-16-2016-2017	Taking into account the nature of the activity and with the objective to maximize the European Added Value and European market uptake through transnational collaboration*, the

	<p>following additional eligibility criteria apply:</p> <ol style="list-style-type: none">1. at least three legal entities shall participate in an action;2. each of the three legal entities shall be established in a different Member State or associated country;3. all three legal entities shall be independent of each other within the meaning of Article 8 of the Rules for participation;4. actions must include the relevant market surveillance authorities in their consortia **. <p>* Transition towards Secure, Clean and Efficient Energy and the Energy Union project are cross-national policy initiatives and priorities aiming at trans-national solutions.</p> <p>** This action aims at the implementation of the Ecodesign Directive, the Energy Labelling Directive and the Regulation on Labelling of Tyres. While monitoring and verification can be done by various actors, only the market surveillance authorities have the power of enforcement.</p>
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Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant [guide](#) published on the Participant Portal.

Consortium agreement: Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.

Call - COMPETITIVE LOW-CARBON ENERGY

H2020-LCE-2016-2017

1. TOWARDS AN INTEGRATED EU ENERGY SYSTEM

Where do we stand?

In the 2020 and 2030 Climate-energy packages, the EU committed to lower greenhouse gas emissions by 20% with respect to 1990 and 40% by 2030 and to reach a share of renewables of 20% by 2020 and at least 27% by 2030.

In this landscape, the electricity network has a central role to play. In 2014, 26% of the EU's power was generated from renewables. About 10% of the total EU electricity is sourced from variable renewable electricity (such as wind and solar). Owing to the increasing number of appliances and to the expected penetration of heat pumps and electric vehicles, the share of electricity in the overall energy consumption is expected to rise and the share of renewables in electricity could be as high as 50% by 2030 with an important contribution from variable sources.

Today, our EU energy system is still strongly linked to borderlines between Member States and connections between the electricity, gas and heat networks are still scarce. Creating links between these networks would provide more flexibility, more resilience and allow a larger penetration of variable renewables. This approach is underpinned by the recent Communication 'Energy Union'. Collaboration between Member States and between regions has obvious benefits for the mutualisation of assets bringing security of supply and the resilience of the system in case of crisis. This is also needed to achieve a fully integrated energy market and will allow us to progress faster in the decarbonisation of our economy. Finally, the Communication highlights the importance of a well-coordinated research and innovation as a key element for our competitiveness.

More variable renewable energy sources in the electricity system in a well-functioning pan-European energy system will require many changes not only in terms of new technologies (e.g. smart energy management systems, energy storage) but also in terms of infrastructures, interconnections between Members States, regulatory environment, harmonization of standards, and new business models from end to end (energy production to final consumption).

The work programme 2014-2015 was calling for actions to modernize the electricity grid and to provide the energy system with flexibility through enhanced storage technologies. During the SET-Plan conference in December 2014, the stakeholders broadly endorsed a revised structure, not only looking at technologies but at the energy system in its ensemble. In this new approach, the active consumer is put at the center of the energy system. Work programme 2016-2017 proposes actions to progress in this direction.

Overall approach for 2016-2017

The center of gravity of Calls 2016 and 2017 remains the electricity system but with a number of openings for transnational collaboration and connections between energy networks. While call 2016 puts emphasis on the electricity distribution system, the call in 2017 is opened for demonstration projects in the field of transmission. Call 2017 also includes links between distribution and transmission networks and links between the electricity network and other energy networks.

Unlike the previous call where smart grid and storage were separated topics, the new integrated approach of the Set-Plan is reflected through topics which integrate demand response, smart grid, storage and links with other networks.

In 2016 and 2017, topic LCE-1 calls for the maturation of promising next generation technologies for the distribution network with RIAs. Such maturation of technologies should occur in a TRL range of typically 3-6 with a recommended EU contribution of EUR 2 to 4 million per project so as to be ready to be used in demonstration projects in about 5 years.

In 2016, topic LCE-2 will be demonstrating technologies for the distribution network which have reached the required level of maturity and evolve in a range of TRL of typically 5-8 in an integrating environment, supported by EU funding between EUR 12-15 million. Such technologies would then be ready for deployment about 5 years after the end of the project. While in topic LCE-1, a technology can be addressed in isolation, there is an obligation of integrating several technologies in topic LCE-2.

In 2017, topic LCE-4 calls for the demonstration of integration of technologies with a center of gravity on the transmission network, but including links with the distribution network in a TRL range 5-8 and EU funding EUR 15-20 million per project. In addition and for the first time, topic LCE-5 calls for tools and technologies for coordination and integration of the European energy system with EU funding of EUR 2-4 million per project.

Topics relevant to this section can also be found in the work programme of the NMBP part, in particular topic NMBP-03-2016 ("Innovative and sustainable materials solutions for the substitution of critical raw materials in the electric power system"), topic NMBP-19-2017 ("Cost-effective materials for 'power-to-chemical' technologies"), topic ICT-15-2016-2017 ("Big Data PPP: Large Scale Pilot projects in sectors best benefitting from data-driven innovation") and in the frame of the EU collaboration with Brazil in topic EUB-02-2017 ("Utilities: energy management at home and in buildings").

It is also anticipated that, pending the discussions between Member States and countries associated to H2020 and the appropriate European Commission services, a budget for an ERA-NET action relevant to this section of the Work Programme 'Towards an integrated EU energy system' could be included in the Call 2017. The scope of such ERA-NET should be identified in the light of its contribution to the SET-Plan, its complementarity with topics LCE-1-5 and its strategic positioning with respect to the ongoing ERA-NET Smart Grid Plus.

The budget distribution between the Topics open in 2017 maybe be subject to revision and their scope adapted following the coverage of projects which will be selected in 2015, answering the topics on transmission grid and large-scale storage in the 2015 call (LCE5 – 2015, LCE6 – 2015, LCE9 – 2015) and the discussions of a potential ERA-NET actions relevant to 'Towards an integrated EU energy system' in call 2017.

Proposals are invited against the following topic(s):

LCE-01-2016-2017: Next generation innovative technologies enabling smart grids, storage and energy system integration with increasing share of renewables: distribution network

Specific Challenge: In a fast evolving and competitive global landscape, Europe needs to develop and mature the next generation of competitive technologies and services for the distribution grid at medium and low voltage levels, which are clearly going beyond the state of the art and will be ready to integrate the market in five to ten years' time. These technologies and services should enable advanced solutions for demand-response, smart grid, storage and energy system integration while respecting the needed stability and security in the context of an increasing share of variable renewable energy sources in the electricity grid.

Scope: Proposals must target technologies, tools and/or services in one of the following areas:

In 2016:

1. Storage: technologies for the storage of energy in the distribution network and their integration and exploitation in the smart grid context, including decentralised storage at user premises or at substation level; this encompasses optimal use of the potential of electric vehicles; particular attention should be put on cost, stability and lifetime;
2. Synergies between energy networks: develop power to heat solutions and strategies (e.g. through the use of water boilers, heat pumps, thermal inertia of buildings, cooling needs, etc.), develop variable renewable power to gas/fuel solutions; technologies for hydrogen production and storage are addressed in the frame of the Fuel Cell and Hydrogen JU and are therefore excluded from this call

In 2017:

3. Demand-response: tools and technology validation for demand response forecast, profiling, segmentation, load forecasting, innovative and user-friendly services for customers based on smart metering; inclusion of Virtual Power Plant and microgrid as active balancing assets; associated innovative market and business models; secure data handling;
4. Intelligent electricity distribution grid: tools for the optimisation of the distribution grid, technologies for autonomous and self-healing grids, energy management and control systems, technologies for advanced power electronics, for enhanced observability, e.g. real-time system awareness; secured communications in the smart grid in particular cyber security and big data analytics.

Proposals will clearly indicate which area is targeted.

Proposals will include a predesign of interfaces to energy networks and will demonstrate a good knowledge and compatibility with current regulations, available or emerging standards and interoperability issues applying to their technologies, in particular in connection to ongoing work in the Smart Grid Task Force and its Experts Groups in the field of Standardization (e.g. CEN-CLC-ETSI M/490), regulatory environment for privacy, data protection⁵⁴, cyber security, smart grid deployment, infrastructure and industrial policy (<http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force>).

A preliminary analysis of potential business models will be made as well as an analysis of potential needs in the field of standards and regulations so that markets can effectively adopt the developed technologies in 5 to 10 years.

Projects will mature technologies in a range of Technology Readiness Level (TRL) of typically 3-6. Proposals will indicate the estimated levels of TRL at the beginning and at the end of the project.

The Commission considers that proposals requesting a contribution from the EU between EUR 2 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In order to ensure the coverage of all areas, for each call, proposals above all thresholds will be ranked in each of the areas opened under the call and the first ranked proposals in each area will be selected until the available budget is exhausted (first, all proposals ranked nb 1, then nb 2, etc.); in case of insufficient budget to select all projects of the same rank to cover the areas, the best scores will prevail; in case of equal scores, usual rules will prevail.

Expected Impact: Proposals must demonstrate that they are relevant, compatible with the broad EU energy policy context such as Climate-Energy packages and Energy Union. Where appropriate, they should also indicate if and how they will contribute to:

- ongoing policy developments in the field of the design of the internal electricity market, of the retail market and ongoing discussions on self-consumption,
- enhanced interconnections between Member States and/or between energy networks.

Proposals must demonstrate contributing to the following overall impacts:

- The EU power network should be capable of integrating large share of renewables (more than 50% by 2030, in particular variable energy sources, up to 90% variable by 2050), in a stable and secure way.

⁵⁴ Commission Recommendation of 10 October 2014 on the Data Protection Impact Assessment Template for Smart Grid and Smart Metering Systems (2014/724/EU)

- EU based companies will be able to deliver adequate competitive product and services on the market in 5 years-10 years after the end of the project.

Proposals will also demonstrate contributing to the following specific expected impacts for each area:

1. Develop energy storage systems providing services to the distribution grid and the consumer at affordable costs, deferral of investments in grid reinforcements, validation of business models;
2. Cost effective conversion of excess electricity, avoid curtailment, provide services to the grid;
3. Enable and/or enhance demand response schemes bringing proven and quantified benefits for the grid and the consumers / prosumers; validation of business models;
4. Improved basis for renewable energy sources hosting capacity, stability and flexibility in the distribution grid operating with large share of variable renewables, reduction of congestion.

Finally, proposals will also include ad-hoc indicators to measure the progress against specific objectives of their choice which could be used to assess the progress during the project life.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-02-2016: Demonstration of smart grid, storage and system integration technologies with increasing share of renewables: distribution system

Specific Challenge: To demonstrate a set of technologies and solutions in an integrated environment with the perspective of introduction in the market in the coming years to enable demand-response, smart grid, storage and energy system integration operating under stable and secure conditions in the context of an increasing share of renewable energy sources in the electricity grid.

Scope: Proposals will target the distribution grid (medium and low voltage levels) and demonstrate a combination of at least 3 of the following aspects:

- Demand-response: mechanisms and tools allowing consumers to participate actively in the energy market and in demand response schemes (e.g. relying on smart metering); demonstration and validation of new business models for combining distributed energy resources, self-consumption and storage with optimized utilisation of distribution networks from all energy carriers;

- Smartening the distribution grid: methodologies for improved control and automation of distribution networks, network management and monitoring tools with particular improved observability of variable generation and consumption loads, integration of Virtual Power Plants and microgrids as active balancing assets,
- Demonstration of energy storage technologies (e.g. batteries, fly wheel, etc.) and/or connections between the electricity network and other energy networks such as power to heat solutions under cost competitive conditions (e.g. through heat storage with water boilers, heat pumps, thermal inertia of buildings, etc.) and power to gas / fuel solutions; demonstration of associated energy management systems and of services provided to the distribution grid and the consumers; technological developments for hydrogen production and storage are addressed in the frame of the Fuel Cell and Hydrogen JU and are therefore excluded from this call but proposal may include the integration of such devices in the demonstration;
- Smart integration of grid users from transport (e.g. electric vehicles, large ships and inland waterway barges while in ports) for charging, providing storage capacity or for their capacity to supply electricity to the grid.

The targeted technology readiness levels (TRL) will range typically between 5 and 8. Proposals will indicate the estimated levels of TRL at the beginning and at the end of the project.

The proposed solutions should be demonstrated in large scale pilots and validated in real life conditions when possible or on real data if by simulation for a period of time ensuring credibility and consistency of conclusions. The funding should be primarily intended to be used to finance integration and coordination aspects; the need to fund hardware such as smart meters, storage devices, etc. should be duly justified in the proposals (Annex 1 and 2).

Proposals will include a detailed analysis of current regulations, standards and interoperability/interfaces issues applying to their case, in particular in connection to ongoing work in the Smart Grid Task Force and its Experts Groups in the field of Standardization (e.g. CEN-CLC-ETSI M/490), regulatory environment for privacy, data protection⁵⁵, cyber security, smart grid deployment, infrastructure and industrial policy (<http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force>).

Cost/benefit analysis, business models and plans for replication must be part of the proposed work.

Proposals will also foresee coordination with similar EU-funded projects (in particular those which will be funded under this call) in particular for policy relevant issues such as regulatory framework, business models, obstacles to innovation. It is recommended to reserve of the

⁵⁵ Commission Recommendation of 10 October 2014 on the Data Protection Impact Assessment Template for Smart Grid and Smart Metering Systems (2014/724/EU)

order of 2% of the EU funding for these activities. A Coordination and Support Action is foreseen for the organisation of this collaboration in this Work Programme (see Topic LCE3).

The Commission considers that proposals requesting a contribution from the EU between EUR 12 and 15 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals must demonstrate that they are relevant, compatible with the broad EU energy policy context such as Climate-Energy packages, Energy Union. Where relevant, they should also indicate if and how they will contribute to:

- ongoing policy developments in the field of the design of the internal electricity market, of the retail market, ongoing discussions on self-consumption,
- enhanced interconnections between Member States and/or between energy networks.

Proposals will demonstrate contributing to the following overall impacts:

- The EU power network will be capable of integrating large share of renewables exceeding 50% by 2030, in particular variable energy sources, in a stable and secure way
- EU based companies will be able to deliver adequate competitive product and services on the market in 2-5 years after the end of the project
- The demonstrated solutions have the potential to be scaled (if needed) and replicated

Proposals will also demonstrate if and how they contribute to the following more specific expected impacts:

- Competitive demand response schemes for the benefit of the grid and the consumers
- Validated contributions for improved, stability and flexibility in the distribution grid, avoid congestion; enabling near real-time pan European energy balancing market;
- Emergence of new services provided by storage systems to the distribution grid and the consumers/prosumers at affordable costs, deferral of investments in grid reinforcement,
- Conversion of excess electricity, avoid curtailment, provide services to the grid
- Creation of synergies with transport users (e.g. services to the grid with smart charging) / support the decarbonisation of transport.

Finally, proposals will also include ad-hoc indicators to measure the progress against specific objectives of their choice which could be used to assess the progress during the project life.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-03-2016: Support to R&I strategy for smart grid and storage⁵⁶

Specific Challenge: The new structure of the SET-Plan⁵⁷ identifies the following Integrated Challenges: Active consumer at the centre of the energy system, Demand focus – increasing energy efficiency across the energy system, System optimisation, Secure, cost-effective, clean and competitive supply as well as some Cross-Cutting aspects. A novel approach to R&I strategy in the field smart grid and storage is needed to address these integrated energy challenges.

Scope: Proposals must put forward a convincing framework to tackle all the following issues:

- Support to the coordination of stakeholder views on R&I strategy using existing structures such as the Smart Grid Technology Platform, the EEGI, EERA, etc., taking into account the structure of Set-Plan the possible coming evolutions of the Set-Plan and Integrated Roadmap governance. Provision should be made to organise 2 plenary meetings per year.
- Analysis of the on-going research, demonstration and innovation projects in the EU and countries associated to H2020 and where possible/relevant at Member States (e.g. thanks to link with national technology platforms) and regional levels;
- Support for the development of a R&I roadmap based on the analysis of ongoing projects and taking into account relevant processes for the consolidation of stakeholders views;
- Organisation of 2 workshops per year in Brussels to enhance collaboration between projects and to establish synergies on policy related aspects (e.g., business models, regulatory framework, financing framework, etc.) of the Horizon 2020 funded projects in the field of smart grid and storage;
- Propose and organise workshops and processes for enhanced cross border knowledge sharing and system optimisation.

The support framework will be capable of hosting a representative set of stakeholders covering the following aspects: generation, transmission, distribution, smart metering, consumers and the following sectors: industry, research centres and academia. Direct (as a beneficiary) or indirect (e.g. under the form of a letter of intent) commitments of stakeholders in the proposal constitute an added value.

⁵⁶ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

⁵⁷ Strategic Energy Technology (SET) Towards an Integrated Roadmap: Research & Innovation Challenges and Needs of the EU Energy System

The Commission considers that proposals requesting a contribution from the EU of around EUR 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Only one proposal will be selected.

The recommended duration of this activity is 48 months.

Expected Impact: Proposals will demonstrate contributing to enhance the efficiency of R&I policy making at EU level. In particular, proposers will demonstrate how and why they are best placed to support the stakeholder's community; their experience in supporting the development of R&I roadmaps, their capacity to organise stakeholders/EU funded projects events while creating output for policy making.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-04-2017: Demonstration of smart transmission grid, storage and system integration technologies with increasing share of renewables

Specific Challenge: The integration of variable renewable energies challenges the transmission network. Also, the target to reach 10% of interconnection of the production capacity calls for new approaches to the transmission network and its management and opens new perspectives in terms of sharing and resources (e.g. production, storage, handling of electricity from variable renewable energy sources) across borders.

Scope: Proposals will target the transmission grid and demonstrate a combination of at least 2 of the following aspects:

- Power transmission technologies and management of large scale generation in the context of an increased share of variable renewables;
- Large scale storage relevant to the transmission network (GWh scale), potentially including several storage technologies addressing different time scale (e.g. daily, seasonal), ramping rates and volumes, managed centrally or in a distributed way;
- Communication / ICT technologies / control tools to enhance real-time awareness, introduce more flexibility the transmission grid, the integration of storage facilities, of more flexible generation, of demand-response mechanism and its interface to the distribution grid; cross-border collaboration;
- New approaches to the wholesale market facilitating the participation of variable renewable energy sources, remunerating adequately new flexibility services to the grid

such as offered by storage, active participation of demand and new players such as aggregators and reducing the cost of operations.

The targeted technology readiness levels (TRL) will range typically between 5 and 8. Proposals will indicate the estimated levels of TRL at the beginning and at the end of the project.

Proposals will include an analysis of current regulations, codes and standards applying to their case as well as an analysis of business models and pan-European EU market integration if relevant. Where appropriate, environmental issues will be addressed in the light of existing regulations (e.g. water framework directive, Natura 2000, etc.).

Proposal tackling problems of transnational nature will be given specific attention.

Proposals will also foresee coordination with similar EU-funded projects (in particular those which will be funded under this call) in particular for policy-relevant issues such as regulatory framework, business models, obstacles to innovation. It is recommended to reserve of the order of 2% of the EU funding for these activities. A Coordination and Support Action is foreseen for the organisation of this collaboration in this Work Programme (see Topic LCE 3)

The Commission considers that proposals requesting a contribution from the EU between EUR 15 and 20 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Proposals must demonstrate that they are relevant, compatible with the broad EU energy policy context such as Climate-Energy packages, Energy Union. Where relevant, they should also indicate if and how they will contribute to:

- ongoing policy developments in the field of the design of the internal electricity market, of the retail market, ongoing discussions on self-consumption,
- enhanced interconnections between Member States and/or between energy networks.

Proposals will demonstrate that the proposed solution can be scaled (if needed) and replicated as well as if and how they contributing to the following points:

The EU power network:

- is capable of integrating large share of renewables (at least 50% by 2030), in particular from variable sources;
- can operate in a stable and secure way;
- operates within a well-functioning wholesale market, providing the EU consumers with competitive prices of electricity and integrating renewable sources in a cost effective manner;

- evolves towards a pan-European network with increased levels of security of resource sharing.

Finally, proposals will also include ad-hoc indicators to measure the progress against specific objectives of their choice which could be used to assess the progress during the project life.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-05-2017: Tools and technologies for coordination and integration of the European energy system

Specific Challenge: The increasing share of variable renewable energy sources and the 2020 and 2030 targets for the reduction of greenhouse gas emission in the EU are calling for important changes in our energy system: more flexibility, more active involvement of all stakeholders and more collaboration. If no actions are taken, the power system will face several risks such as, poor quality of the electricity supply, congestion, lack of stability, excessive levels or curtailments, impossibility to cope with electro mobility demand, etc. The challenge is therefore to create and deploy common tools for planning, integration and operation across the energy system and its actors.

Scope: Proposals must target the development of technologies, tools and systems in one or several of the following areas:

1. Novel European grid and end-to-end energy system planning tools, including foreseeable features such as storage, aggregation, demand-response and integrating cost aspects;
2. Enhanced TSO / DSO collaboration and coordination tools, secure data exchange across networks along whole the value chain, ICT tools for cross-border trading for nearly real-time balancing; definition of minimum set of specifications to allow automated digital cross-border electricity market;
3. Solutions for the deployment of neutral data access points ensuring a fair and transparent data access to all energy actors (TSOs, DSOs, ESCOs, Telcos, ICT companies, consumers, etc.); validation of new business models resulting from the cooperation between them; investigation of incentives and possible commercial arrangements with a fair share of benefits across actors;
4. Synergies between electricity, gas and heat networks, associated business and market mechanisms and analysis of existing regulatory aspects; technologies for hydrogen production and storage are addressed in the frame of the Fuel Cell and Hydrogen JU and are therefore excluded from this call;
5. Socio-economic aspects and environmental aspects related to large scale infrastructures relevant to renewable generation and changes to transmission infrastructure need for

their integration; socioeconomic aspects of consumer behaviours in demand-response mechanisms, consumer engagement.

Proposals will demonstrate a good knowledge and compatibility with current regulations, available or emerging standards and interoperability issues applying to their technologies, in particular in connection to ongoing work in the Smart Grid Task Force and its Experts Groups in the field of Standardization (e.g. CEN-CLC-ETSI M/490), regulatory environment for privacy, data protection⁵⁸, cyber security, smart grid deployment, infrastructure and industrial policy (<http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force>).

The Commission considers that proposals requesting a contribution from the EU between EUR 2 and 4 million would allow this specific challenge to be addressed appropriately and between EUR 0.5 and 1 million for proposals addressing area 5 only. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In order to ensure the coverage of each area, proposals above all thresholds will be ranked in each of the 5 areas and the first ranked proposals in each area will be selected until the available budget is exhausted (first, all proposals ranked nb 1, then nb 2, etc.); in case of insufficient budget to select all projects of the same rank to cover the 5 areas, the best scores will prevail; in case of equal scores, standard rules do apply.

Expected Impact: Proposals must demonstrate that they are relevant, compatible with the broad EU energy policy context such as Climate-Energy packages, Energy Union. Where relevant, they should also indicate if and how they will contribute to:

- ongoing policy developments in the field of the design of the internal electricity market, of the retail market, ongoing discussions on self-consumption,
- enhanced interconnections between Member States and/or between energy networks.

Proposals must demonstrate if and how they contribute to the following impacts.

1. Optimized grid planning and design at European level, maximizing the capacity of the grid to host variable renewables, take full advantages of a pan-European grid for stability and security
2. Safe, secure, efficient and coherent data handling, enabling more cross border trading and real time balancing
3. Enabling new flexibility services to the grid associated with new business opportunities, offering the access to cheaper energy for the consumers and maximising the social welfare

⁵⁸ Commission Recommendation of 10 October 2014 on the Data Protection Impact Assessment Template for Smart Grid and Smart Metering Systems (2014/724/EU)

4. Increasing the potential of exchanges between energy networks, enhanced security of supply, create business opportunities, avoidance of curtailment, offering new services to the grid
5. Account for human behaviour in the design of infrastructure and demand-response to avoid blockages due to social acceptance, placing the consumer at the center of the energy system.

Finally, proposals will also include ad-hoc indicators to measure the progress against specific objectives of their choice which could be used to assess the progress during the project life.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

2. RENEWABLE ENERGY TECHNOLOGIES

One of the major challenges Europe will face in the coming decades is to transform its energy system, allowing for secure affordable and efficient energy, while ensuring Europe to be global leader for renewables.

To help address such ambitious challenges, the European energy research and innovation strategy aims at developing and accelerating the time to market of affordable, cost-effective and resource-efficient low carbon energy technology solutions, that would decarbonise the energy system in a sustainable way while increasing role of domestic sources in the energy mix to secure energy supply. This strategy is embedded in the Strategic Energy Technology Plan (SET-Plan) and fully contributes to the Energy Union objectives.

The scale and ambition of research and innovation challenges to be addressed requires enhanced cooperation between all stakeholders involved, including the EC, Member State administrations at national, regional and local level, the industry, the research community and society at large.

The SET-Plan Integrated Roadmap, alongside the specific Technology Roadmaps and Implementation Plans from the European Industrial Initiatives and the Strategic Research Agendas developed by the European Technology Platforms, provide guidance for the development of all of the renewables. However, each area of renewables has its own challenges, potential, history, level of maturity, risks, and competitive situation that requires specific and considered approaches.

It is fundamental that the different renewable energy technologies will be supported with targeted actions, explicitly designed taking into account the individual technology potential and its maturity level, its potential efficiency, performance and cost in comparison to efficiency, performance and costs that the specific technology has achieved to date. In addition, distinctive elements that could foster global industrial competitiveness and

contribute to European security of supply will be taken into account when defining the targeted support actions.

The priority setting for the support to the development of renewable energy technologies will therefore be as follows:

1. The highest priority will be given to support the next set of technologies that should be readied for cost-competitiveness and introduced in the market as soon as possible (off-shore wind, certain areas of PV, CSP, tidal and wave energy, and geothermal energy);
2. The next level of priority will be given to continue support those technologies that have started to reach cost-competitiveness but where continued efforts are needed to increase this, broaden it to the full sector, and build out the European industry position (on-shore wind, areas of PV, advanced biofuels, and solar heating and cooling);
3. To continue appropriate levels of support for new and emerging technologies (e.g. advanced and solar fuels, ocean thermal energy conversion (OTEC), salinity gradient energy, etc.), to fully mature technologies where further innovation remains important (hydropower, PV-thermal) and to replace critical pollutant/expensive materials by eco-friendly/sustainable materials.

As a result, the Energy Challenge strives to provide an appropriate support to all new and existing renewable energy sources, developing a balanced portfolio of renewable energy technologies across the full pipeline of research and innovation, from basic research, technology development, technology demonstration and supply-side market readiness, demand-side market up-take, as well as support for first market replication of renewable energy plants. A schematic overview of the portfolio that will be supported is provided later on.

It also aims to assist Member States in a flexible choice of how they could contribute to address the highlighted challenges, either aligning support of their national research and innovation instruments or cooperating at a deeper level between themselves and the European Commission.

DEVELOPING THE NEXT GENERATION OF RENEWABLE ENERGY TECHNOLOGIES

Proposals are invited against the following topic(s):

LCE-06-2017: New knowledge and technologies

Specific Challenge: The technologies that will form the backbone of the energy system by 2030 and 2050 are still under development. Promising technologies for energy conversion are being developed at laboratory scale and need to be scaled up in order to demonstrate their potential value in our future energy system. These new technologies should provide more

flexibility to the energy system and could help adapting to changing climatic conditions. New knowledge and more efficient and cost-competitive energy technologies, including their conventional and newly developed supply chains, are required for the long run. It is crucial that these new technologies show evidence of promising developments and do not represent a risk to society.

Scope: One of the following technology-specific challenges has to be addressed:

- **New renewable energy technologies:** *Developing the new energy technologies that will form the backbone of the energy system by 2030 and 2050:* Excluding wind energy and sustainable fuels addressed in the other bullet points, and photovoltaic new materials addressed in [the NMP programme], the challenge is to scale up energy technologies currently in development at laboratory scale. It is crucial that these new, more efficient, and cost-competitive energy generation and conversion technologies, demonstrate their potential value in the future European energy system. Developments in sectors other than energy may provide ideas, experiences, technology contributions, knowledge, new approaches, innovative materials and skills that are of relevance to the energy sector. Cross-fertilisation could offer mutually beneficial effects.
- **Wind energy:** *Improved understanding of the physics of wind as a primary resource and wind energy technology:* For an improved design of large-scale wind rotors a better understanding of the underlying physics is needed. The challenge is to increase understanding of the underlying physics and to significantly improve the simulation capability for multi-scale wind flows, loads and materials failure. Significant high-performance computing (HPC) resources will be needed for this challenge. It is expected that further research towards this challenge will continue after the project, therefore the data retrieved in this project should be with open access. Research results could contribute to IEA Wind and for that reason cooperation with IEA partner countries is expected. International cooperation with leading groups outside Europe is encouraged. This research will contribute to making wind energy fully competitive, through a better design of the wind turbine and having an impact on the turbine efficiency and therefore on the cost of energy produced.
- **Sustainable Fuels:** *Diversification of renewable fuel production through novel conversion routes and novel fuels:* Novel technologies for sustainable fuel production and novel fuels having a potential value in our future transport energy system should be developed at laboratory scale. The specific challenge is to diversify the sustainable fuel production taking into account long-term dependencies on fossil fuels of particular transport sectors by developing novel fuels and processes that in the long-term can bring down substantially transport fuel costs while overcoming sustainability constraints and feedstock limitations. While biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded, this research shall enable novel fuel production addressing one of the following pathways:

- o Development of novel microorganisms, enzymes and catalysts or a combination of these systems with improved performance for obtaining paraffinic biofuels or higher alcohols from lignocellulosic biomass;
- o Development of renewable alternative fuels from CO₂ in industrial waste flue gases through chemical catalytic conversion;
- o Development of renewable alternative fuels from H₂O, CO₂ and energy from renewable, autonomous sources through micro-organisms, synthetic molecular systems or chemical synthesis, or a combination of these processes;
- o Development of middle distillate range biofuels (i.e. diesel and jet fuel) from liquid organic or lignocellulosic waste streams through advanced thermochemical conversion processes.

Aside from the technology-specific challenges mentioned above, potential environmental, resource efficiency and safety concerns, issues related to social acceptance or resistance to new energy technologies, as well as related socioeconomic and livelihood issues also should be addressed, where relevant. This may require a multi-disciplinary perspective with contributions also from the social sciences and humanities, which then should be integrated into the research process from the outset. A methodology that permits a sustainability assessment of the environmental (notably in terms of GHG performance), as well as economic and social benefits with respect to current technologies should be included.

Novel technology solutions for grid integration, storage, fuel cells and hydrogen – other than integral to the technology solution developed, energy efficiency and smart cities will not be supported under this topic but in the relevant parts of this work program.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The results of this research are expected to move the technology involved to TRL 4 and to provide better scientific understanding and guidance enabling the players concerned (e.g. policy makers, regulatory authorities, industry, interest groups representing civil society) to frame strategic choices concerning future energy technologies and to integrate them in the future energy system. It is also expected that new, out-of-the-box or advanced innovative ideas will emerge that will provide new impetus to technology pathways, to new solutions, and to new contributions to the energy challenge in Europe or worldwide.

Where relevant, the new developed technology pathways should improve the economic, environmental and social benefits of renewable energy. Notably, for sustainable fuels they should improve the conversion efficiency that will eventually allow significant cost reduction.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-07-2016-2017: Developing the next generation technologies of renewable electricity and heating/cooling

Specific Challenge: The technologies that will form the backbone of the energy system by 2030 and 2050 are still in the research and development cycle and need to be fully developed before they could fully demonstrate their potential value in our future energy system. It is crucial that these new technologies show evidence of promising developments and do not represent a risk to society.

Scope: At least one of the following technology-specific challenges has to be addressed in 2016:

- a. **Photovoltaics:** *Developing next-generation increased efficiency high-performance crystalline silicon c-Si PV cells and modules:* c-Si technology holds a dominant share of the PV market and is expected to continue playing a central role for PV industry for some time in the future. The challenge is the development of advanced high-performance c-Si cells and modules based on novel architectures and/or processes which tackle efficiency limitations while improving cost-effectiveness⁵⁹. It is necessary to demonstrate device designs and fabrication processes of technologies with efficiencies higher than 25% at cell level and above 21 % at the module level and at the same time pilot manufacturing readiness at a competitive cost.
- b. **Concentrated Solar Power (CSP):** *Innovative components and configurations for CSP plants:* In spite of cost reductions in recent years, cost competitiveness remains a crucial barrier to the deployment of CSP plants. Several concepts with a potential for cost reduction are being explored. It is necessary to validate in relevant environment the feasibility of these concepts. Significant improvements with regard to one or more of the elements of a CSP plant (heat transfer fluids which can be used for direct thermal energy storage⁶⁰; the solar field; high temperature receivers allowing for new cycles) are needed to reduce the cost of this technology.
- c. **Solar Heating and cooling (SHC)**⁶¹: *Innovative components for solar compact hybrid systems:* It is necessary to improve the cost competitiveness, performance and acceptability of solar compact hybrid systems (heating systems combining a solar system

⁵⁹ A related activity is supported under topic NMBP 19-2016 "Advanced materials solutions and architectures for high efficiency solar energy harvesting", included in the work programme of 'Leadership in enabling and industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing', in which the focus lies on the materials and materials combinations.

⁶⁰ A related activity is supported under topic NMBP 19-2016 "Advanced materials solutions and architectures for high efficiency solar energy harvesting", included in the work programme of 'Leadership in enabling and industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing', in which the focus lies on materials.

⁶¹ Activity addressing this challenge contribute to the PPP on Energy-efficient Buildings.

and a backup-heater), addressing developments needed in the areas of improved components, easier installation (plug and play), improved control and operation methods, compact and simplified design. Single family homes and/or multifamily homes and/or public buildings are particularly challenging targets, requiring assessing the implications for the user in terms of operation and maintenance of the system.

- d. **Wind energy:** *Advanced control of large scale wind turbines and farms:* The current progress in wind energy like larger wind turbines and farms, floating offshore wind, but also specific geographical challenges, require the development of advanced control strategies to improve efficiency and to further reduce the cost of wind energy as well as to increase the value of wind energy by improving the response to power system disturbances or electricity market conditions. While one of the primary challenges to be addressed is the development of new controls systems that treat the entire wind plant as a controls optimization problem it is also needed to optimize energy capture for individual assets with the wind-turbine-centric controls and to develop a better understanding of the wind resources and better wind forecasting methods. The overall challenge is to design an integrated approach to advanced operation of a wind turbine and/or farm, to improve performance for new and operating wind power plants and improve control of the wind turbine and/or farm, reducing the failure rate and therefore resulting in less operation and maintenance.
- e. **Ocean Energy:** *Increased performance and reliability of ocean energy subsystems:* The priority for the ocean energy sector is to increase significantly the performance, reliability and survivability (15-20 years target) of ocean-energy devices developing solutions based on alternative approaches, sub-systems and materials. An integrated research and development approach is needed to reach maximum impact for the whole sector, and to make ocean energy commercially attractive for investors. The challenge resides in an improved understanding of component failure and low reliability in current ocean-energy devices, and in the development of ocean energy devices of improved performance, contributing to reduce the cost of ocean-energy. A fundamental challenge to be addressed is the development of novel and advanced reliable prime mover (e.g. system blades, pitch and hub for TECs and device structure for WECs) and the development of novel and advanced power take-off and control systems, converting mechanical energy from prime mover into grid compliant electricity.
- f. **Hydropower:** *Environmentally friendly hydropower solutions:* There is a need to improve the understanding of river ecology and the relation to river regulation. The challenge is to provide reliable knowledge based on high quality quantified data sets and suitable methods, models and devices allowing policy makers and hydropower plant designers and operators to take decisions on the ecologic compatibility of planning and operating hydropower stations. To meet the overall objective of self-sustaining fish populations, measures such as habitat improvement, nature based environmental flows, sediment management (spawning area), and fish passage facilities or their combination may be implemented. To identify the most cost-effective measures or their-combination,

it is necessary to include systematic investigations on selected power stations in various Member States of different climatic and ecologic conditions, identify fish species most at risk from hydropower projects. At the scale of the power plant the establishment of the correlations between design parameters of the plants and turbines respectively the survival rates for selected, representative species are needed to create models for fish mortality which should be verified at selected stations and assessed by testing/validating suitable prototypes/devices. Obtaining these data is fundamental to enable decision makers on all levels to plan, commission and operate hydropower plants with full respect of ecological regulations and policies and to meet the Water Framework Directive requirements.

- g. **Geothermal Energy:** *Shallow geothermal (low temperature) Improving borehole heat exchangers:* Cost-effectiveness and efficiency of geothermal systems for heating and cooling in individual or multiple (i.e. district heating) installations can be improved introducing new and more efficient materials. Increased efficiency of heat exchangers will bring costs down and increase the attractiveness of geothermal energy for heating and cooling applications. The challenge is to develop new materials and systems to improve the efficiency of borehole heat exchangers by increasing the heat exchanged with the surrounding ground and water to make geothermal sources for heating and cooling more economically attractive.
- h. **Combined Heat and Power:** *Development of highly-efficient, low-emission medium- and large-scale biomass-based CHP systems.* CHP has a high potential for heat and electricity production in particular for decentralised applications. However, the challenge is to increase both technology performance and resource efficiency, while reducing environmental impacts. Cost effective, robust and low emission (both CO₂ NO_x and particles) medium and large-scale industrial CHP (>1MW) with high thermal and electrical efficiency and increased high-temperature heat potential up to 600°C need to be developed allowing the use of a wider base of solid, liquid or gaseous sustainable biomass and recovered feedstock. Ash use or removal, as well as ash challenges during combustion, requires particular attention. A significant step forward in the technology efficiency together with a reduction in resource consumption and reduced emissions is needed, to deliver reduced costs, both operation and maintenance, and increased attractiveness of renewable heating.
- i. **RES integration in the energy system:** *RES system support functions for the future energy system:* In a future European energy scenario with very high shares of renewables (up to 100%) in the energy mix, system support functions that are provided today by synchronous generation will need to be provided by renewable generation or procured from third parties. RES should significantly contribute to a more stable operation of the future energy system, allowing growing percentage of renewable sources to displace traditional dispatchable generation. The challenge is to define and develop system support functions or ancillary services for the contribution of different RES technologies to stable and safe energy system operations in the best technical and economic way.

Development and validation of system support functions from renewables, provided at transmission and distribution grid level, is needed; there is also a need to define the most suitable pathways to include the identified functionalities needed into the different RES development roadmaps, staggering their development in parallel to the development of the network connection codes.

For 2017, at least one of the following technology-specific challenges has to be addressed:

- a. **Photovoltaics:** *Developing next-generation increased-efficiency high-performance perovskite PV cells and products*⁶²: Recently the power conversion efficiency of lead halide perovskite-based thin film photovoltaic devices achieved exceptional progress. Improvements in solution processing and stability, combined with the earth abundance of the constituent materials, have made the lead halide perovskites among the most promising solar cell materials. The challenge is to further develop perovskite solar cells toward their theoretical power conversion efficiency and their commercially and environmentally viable fabrication. It is necessary to demonstrate device designs and price competitive fabrication processes of technologies with sufficient stability and at least 21% efficiency at cell level.
- b. **Concentrated Solar Power (CSP):** *New cycles and innovative power blocks for CSP plants*: In spite of cost reductions in recent years, cost competitiveness remains a crucial barrier to the deployment of CSP plants. Several innovative concepts for new cycles and power blocks with a potential for lifecycle cost reduction are being explored. The challenge is to validate the feasibility of these concepts in relevant environment.
- c. **Solar Heating and cooling (SHC)**⁶³: *Development of components for residential single-family solar-active houses*: The potential of solar heating can be further exploited in residential buildings to cover a significant fraction of the heat demand. Developments are needed in the areas of improved components, innovative materials, improved control and operation methods, innovative configurations. The challenge is for solar heating to cover at least 60% of the heat demand of a single family home, while minimizing the implications for the user in terms of operation and maintenance of the system.
- d. **Wind Energy:** *Reduction of environmental impact of wind energy*: The challenge is to develop potential mitigating strategies or alternative solutions and to increase public acceptance of wind energy, thereby shortening consenting procedures, on the basis of an increased scientific understanding of the social and environmental impact of wind turbines and (clusters of) wind farms both on and off-shore (including floating) and to identify solutions for improved wind turbines/farms with less impact. Innovative mitigation actions could increase the deployment possibilities for wind energy,

⁶² A related activity is supported under topic NMBP 19-2016 "Advanced materials solutions and architectures for high efficiency solar energy harvesting", included in the work programme of 'Leadership in enabling and industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing', in which the focus lies on the materials for a broader range of technologies.

⁶³ Can be considered contributing to EeB

developing a better understanding of the impact of wind energy on the environment as there are still gaps in the knowledge which result in long consenting procedures and reduced deployment possibilities and secondly, developing innovative mitigation actions. Cooperation with NGOs and civil society groups is essential for further investigation of the roots of resistive behaviour as engaging and involving concerned communities can facilitate addressing this specific challenge.

- e. **Ocean Energy:** *Development of advanced ocean energy subsystems: innovative power take-off systems and control strategies:* The challenge is to improve performance of ocean energy devices and reduce the overall cost of ocean energy by means of the demonstration of innovative power take-off systems and control strategies in order to increase power capture and power conversion efficiency, to reduce cost of components in the systems and to increase power quality. For the advanced sub-system an improved understanding of their interaction with energy resource is needed. Further, new system designs and methodologies are needed to enhance reliability and performance levels, making a step change in the sector and introduce as well a certain level of standardisation.
- f. **Hydropower:** *Increasing flexibility of hydropower:* Hydropower is still amongst the largest sources of renewable energy. The challenge is however to make hydropower available in a time as short as possible independent of plant size. New technologies, generators and turbine designs need to be developed to increase ramping rates and to allow start-stop-cycles to reach up to 30 times per day depending on head and volume, while lifetime of components and respective life time prediction methods under heavy-duty operating conditions are considerably improved and at the same time avoiding adverse effects on downstream water courses. The refurbishment and simultaneous upgrading of hydropower stations offers a huge potential to increase renewable electricity production; the challenge is to leverage the storage potential of hydropower for grid balancing on the base of new technologies, finally allowing plant operators to operate successfully in the modern power markets and to make a significant contribution to European renewable energy objectives and policies.
- g. **Geothermal Energy:** Deep Geothermal (medium-high temperature): *Materials for geothermal installations:* Geothermal resources at medium-high temperature can produce at competitive costs electricity, heat or a combination of both. With the increase of the temperature the geothermal fluids become more aggressive, corrosion and scaling might occur and the efficiency and longevity of the plant components are at stake. Geothermal plant reliability must be improved. The challenge is to develop new materials and systems to increase efficiency and longevity of the installations, by securing the integrity of the well and of the equipment, with particular reference to the pumps. Reduced well losses and increased efficiency and longevity of the plant components will lower the risks associated with deep geothermal installations and increase cost-competitiveness by reducing the replacement frequency of components.

- h. **Combined Heat and Power:** *Transforming renewable energy into intermediates:* Biomass and other renewable and waste carbon sources offer a far unexplored potential as storable renewable energy source in integrated systems. Improving storage characteristics of upgraded biomass and other renewable and waste carbon sources will provide a flexible element for heat and power production and for balancing the grid stability, as well as for transport applications, therefore majorly contributing to the EU 2020 energy objectives. The challenge is to develop viable processes and deliver possible economic benefits along the value chain via power-to-gas and/or power-to-liquid concepts for RHC, transport and storage applications, using hydrogen or syngas or liquid renewable carriers produced from excess electricity from PV or wind for biomass gasification or liquefaction or in biogas plants to enhance the yields of syngas or biogas as well as for waste carbon upgrading.
- a. **RES integration in the energy system:** *RES system support functions for the future energy system:* In a future European energy scenario with very high shares of renewables (up to 100%) in the energy mix, system support functions that are provided today by synchronous generation will need to be provided by renewable generation or procured from third parties. RES should significantly contribute to a more stable operation of the future energy system, allowing growing percentage of renewable sources to displace traditional dispatchable generation. The challenge is to define and develop system support functions or ancillary services for the contribution of different RES technologies to stable and safe energy system operations in the best technical and economic way is needed. Proposals should propose, develop and validate system support functions from renewables, provided at transmission and distribution grid level, and include the definition of the most suitable pathways to include the identified functionalities needed into the different RES development roadmaps, staggering their development in parallel to the development of the network connection codes.

Proposals should address one or more of the technology-specific challenges described above. Combining renewables areas, when new innovative ideas could bring breakthrough, is welcome, but the proposal should have a clear focus on at least one of the technology specific challenges. The proposals should bring technology solutions to TRL 4-5 at the end of the action.

Environment, health and safety issues shall be considered in all developments and appropriately addressed.

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators, expected impacts, as well as provide for development of explicit exploitation plans.

Technical issues, synergies between technologies, regional approaches, socio-economic and environmental aspects from a life-cycle perspective (including public resistance and acceptance, business cases, pre-normative and legal issues, pollution and recycling) need to be appropriately addressed wherever relevant. As in many cases, renewable energy projects are

part of complex ecosystems, with links to broader environmental, socioeconomic and livelihood issues that are of particular relevance to local communities, multidisciplinary research designs that integrate contributions also from the social sciences and humanities are encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Further to what mentioned for the specific technologies, proposals focusing on the technology specific challenges a) to h) should address all the general impacts listed below:

- Reduce the technological risks for the next development stages;
- Significantly increased technology performance;
- Reducing life-cycle environmental impact;
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities;
- Contributing to the strengthening the European industrial technology base, thereby creating growth and jobs in Europe;
- Reducing renewable energy technologies installation time and cost and/or operational costs, hence easing the deployment of renewable energy sources within the energy mix;
- Increasing the reliability and lifetime while decreasing operation and maintenance costs, hence creating new business opportunities;
- Contributing to solving the global climate and energy challenges.

The proposals focusing on the technology-specific challenge i) in 2016 and on the technology-specific challenge j) in 2017 should address all the following impacts:

- Improving EU energy security;
- Making variable renewable electricity generation more predictable and grid friendly, thereby allowing larger amounts of variable output renewable sources in the grid;
- Bringing cohesion, coherence and strategy in the development of new renewable energy technologies;
- Contributing to solving the global climate and energy challenges.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-08-2016-2017: Development of next generation biofuel technologies

Specific Challenge: New sustainable biofuels technologies need to be developed that improve performance, notably with regards to the following sub-challenges:

- a. improving the technology competitiveness by upgrading the conversion efficiency and possibly diversifying the technology;
- b. improving the feedstock supply by reducing the supply costs and possibly diversifying the biomass feedstock.

Scope: Proposals should aim at developing the next wave of sustainable liquid biofuels by moving technologies from TRL 3-4 to TRL 4-5.

Environment, economic and social issues including health and safety should be considered and appropriately addressed. A methodology that permits robust and reliable sustainability assessment of the environmental (notably in terms of GHG performance), economic and social benefits with respect to current technologies should be included.

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

Proposals should address both sub-challenges described above, while the main effort in 2016 shall be in addressing sub-challenge a) and in 2017 sub-challenge b). They should also address the particular transport sectorial needs where relevant.

In particular, proposals shall address one of the following:

In 2016:

- Paraffinic biofuels (e.g. diesel and jet fuel) from sugars through chemical and biochemical pathways or through a combination of these pathways;
- Biofuels from pyrolysis or hydrothermal liquefaction and process integration with existing biodiesel or oil refineries;
- Synthetic biofuels/hydrocarbons through biomass gasification.

In 2017:

- Biofuels from CO₂ in industrial waste flue gases through biochemical conversion by autotrophic (chemo and photo –autotrophic) micro-organisms;
- Biofuels from organic fraction of municipal and industrial wastes through thermochemical, biochemical or chemical pathways with improved performance and sustainability;

- Biofuels from phototrophic algae & bacteria with improved performance and sustainability.

An important element will be an increased understanding of risks (whether technological, in business processes, for particular business cases, or otherwise in each area), risk ownership, and possible risk mitigation. Proposals shall therefore include appropriate work packages on this matter.

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators, expected impacts, as well as provide explicit exploitation plans.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 6 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The new developed technology pathways should improve the economic, environmental and social benefits of biofuels. Favourable energy and GHG balances are expected, as well as a significant cost reduction, which would permit these fuels to compete favourably with conventional biofuels. A favourable performance on secure and affordable energy supply and diversified, cheap feedstock supply are expected. In addition, positive impacts on enhancing Europe's competitiveness should be anticipated where appropriate.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

DEMONSTRATING INNOVATIVE RENEWABLE ENERGY TECHNOLOGIES

LCE-09-2016: Increasing the competitiveness of the EU PV manufacturing industry

Specific Challenge: The European PV manufacturing industry has faced strong foreign competition in the last years, which has led to a dramatic reduction of its production capacity. The challenge is to develop innovative manufacturing solutions that substantially improve competitiveness of the European PV manufacturing industry and help regain a part of the potentially increasing worldwide PV market, while creating more secure and sustainable supply chains for the European PV market

Scope: Demonstrating manufacturing innovation and scale-up of highly performing PV technologies at pilot-line level, targeting GW-scale, high-yield throughput and cost-effective industrial production of cells and modules.

Applications for Innovation Actions (bringing the technology from TRL 5-6 to 6-7) are invited.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 15 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: Trigger new investments in the European PV industry, via the establishment of pilot lines which target innovative/optimised production processes and/or tailored development of equipment for mainstream PV technologies at the state of the art of research, and show the potential for cost and performance competitiveness of the final product.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-10-2017: Reducing the cost of PV electricity

Specific Challenge: Much of the R&D efforts in recent years have focused on the development of high-efficiency PV cells at low cost. However, the cost of a PV system also depends on a number of other elements and components. The reduction of their cost and the enhancement of their performance show ample margins for improvement and can considerably help reducing price and accelerating large-scale deployment of PV installations; however this still represents a challenge.

Scope: Proposals are requested to address the reduction of the cost of PV electricity by optimising the PV system energy yield and lifetime and decreasing cost at module (encapsulation materials, glass, and antireflective layers, anti-soiling layers, module architecture, etc.), balance-of-system component (electronics, inverters, tracking systems, etc.) or system configuration levels.

Applications for Innovation Actions (bringing the technology from TRL 5-6 to 6-7) are invited.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 to 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: For a given technology, demonstration of cost-effective solutions (expressed by a considerable reduction of cost per kWh) with increased energy yields at module/system level (under standard as well as actual operating conditions). Solutions are also expected to contribute to reduce energy payback time for the PV system and, when applicable, to increase lifetime. At module level, solutions should show increased cost effectiveness for recycling.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-11-2017: Near-to-market solutions for reducing the water consumption of CSP Plants

Specific Challenge: In spite of the improvements in recent years, water consumption remains a crucial barrier to the deployment of CSP plants especially in arid areas. The challenge is to drastically reduce water consumption.

Scope: Projects shall demonstrate cost-effective technical solutions which significantly reduce or replace the water consumption of CSP plants. The demonstration shall take place in a region with very good solar resource values (Direct Normal Irradiation > 2000 kWh/m² year).

Since the availability of water resources particularly in arid areas is linked to broader socioeconomic and livelihood issues and therefore of particular relevance to local communities, multidisciplinary research designs that integrate contributions also from the social sciences and humanities are encouraged. Engaging and involving local communities, and further investigating the roots of social acceptance or any resistance to CSP plants, so as to develop mitigating strategies or alternative solutions, should likewise be part of the project.

TRL 7 shall be achieved at the end of project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 12 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: The action will result in significant exploitation prospects for the European technology in the field of CSP deployment, bringing cost effective solutions that improve the environmental profile.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-12-2017: Near-to-market solutions for the use of solar heat in industrial processes

Specific Challenge: The potential for the use of solar heat for industrial purposes is still largely untapped. The challenge is to reduce the technical complexity and develop cost effective solutions.

Scope: Proposals shall demonstrate less complex and cost effective technical solutions which significantly increase the share of solar heat in industrial processes and which can be easily integrated into existing industrial plants.

TRL 7 shall be achieved at the end of project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: The action will result in solutions which demonstrate that solar heat can be a reliable energy source for industrial processes, therefore bringing significant prospects for the market uptake of this renewable energy source and for the decarbonisation of industrial processes.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-13-2016: Solutions for reduced maintenance, increased reliability and extended life-time of off-shore wind turbines/farms

Specific Challenge: The challenge is to achieve a very substantial reduction in Operation and Maintenance (O&M) costs through new O&M and control concepts, including logistics planning, decision making and operation, providing an optimized balance between maximizing generation and minimizing loads on the turbines, and reducing the number of inspections and repairs with more remote monitoring and operations.

Scope: Offshore wind turbines, both fixed bottom and floating, are subject to high loads in form of vibrations from wind and waves, as well as from rotation of the turbines. The focus is to reduce the need for maintenance of wind turbines/farms and to develop measures for life-time extension, demonstrating innovative solutions and tools, and thereby the levelised cost of wind energy. The action can include the development of tools for doing predictive

maintenance, hereunder models of component/soil degradation, and establishment a database with operational and failure data for validation of tools. The actions should consider not only the wind turbines but also the substructure and the soil conditions.

Participation of wind turbine manufacturers and large wind farm operators is expected.

TRL 7 shall be achieved at the end of project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 7 to 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: The action will result in the reduction of component failure and increased reliability. The development of innovative solutions and tools will result in more reliable wind turbines and plants. It is expected that the output of the project will significantly contribute to an improved performance for new and operating off-shore wind power plants and therefore to the cost of energy. Presented tools and solutions might have an exploitation potential in the onshore wind sector. The action should contribute to the strengthening the European industrial technology base, thereby creating growth and jobs in Europe.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-14-2017: Demonstration of large >10MW wind turbine

Specific Challenge: Up-scaling projects often lead to the development of better or less expensive applications for smaller turbines.

EU-funded projects have been working on the design of 10-20 MW wind turbine concepts for some time. The challenge is to demonstrate and construct now a full scale >10MW turbine and provide proof of a significant cost reduction potential.

Scope: The development of large scale (>10MW) turbines will have intrinsically logistical requirements regarding handling, installation, operation and maintenance, constituting a large part of the levelised cost of energy (LCOE). Improved handling (storage, loading, transport, etc.) on land, in the harbours and/or at sea, as well as improved logistics around operations and maintenance have to be taken into account in this innovation action.

TRL 7 shall be achieved at the end of project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged. Activities to

engage and involve local communities in the innovation action, to further improve social acceptance are encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 20 to 25 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

Expected Impact: This action will have a positive effect on the cost of energy and offshore wind energy will become more cost-effective. Developing cost-effective and reliable large turbines will contribute to make wind power fully competitive. In 2030 the cost of energy for offshore wind should be reduced at least by 50%. The action will also result in a more effective use of the seas and oceans, and will reduce the time needed for installation, operation and maintenance. The action should contribute to the strengthening the European industrial technology base, thereby creating growth and jobs in Europe.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-15-2016: Scaling up in the ocean energy sector to arrays

Specific Challenge: Scaling up in the ocean energy sector to arrays is a fundamental challenge to be addressed in order to show a reduction of the cost of energy while mastering the risks at project level. There is significant learning to be captured through the demonstration of arrays.

Scope: Applying projects will have to clearly describe the selected technology. The chosen project technology will have to bring evidence at the date of application of previous technology demonstration in real conditions connected to the grid to enhance the likely success of the project and provide a clear cost reduction roadmap that deploying in the pilot project will achieve. Installing more than one technology in the same array is permitted, but this should clearly have added value to this action. The installation has to be grid-connected.

The project has to include a clear go/no go moment ahead of entering the deployment phase. Before this go/no go moment, the project has to deliver the detailed engineering plans, a complete business and implementation plan and all needed permits for the deployment of the array. A committee of independent experts will assess all deliverables and will give advice for the go/no decision.

TRL 7 should be achieved at the end of the project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

Ocean energy projects are part of complex marine ecosystems, with links to broader environmental, socioeconomic and livelihood issues that are of particular relevance to local

communities. Actions to engage and involve local communities, to further improve social acceptance are encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 and 15 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The action will deliver a cost-effective array and hence will demonstrate pathways to reduce the cost of energy. It is expected that as a result of this action, ocean energy would become more commercially attractive for investors. The action should contribute to the strengthening the European industrial technology base in the ocean energy field, thereby creating growth and jobs in Europe.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-16-2017: 2nd Generation of design tools for ocean energy devices and arrays development and deployment

Specific Challenge: The challenge is to develop and demonstrate new advanced tools based on the first experiences of ocean energy arrays. Enabling technical risk reduction and attracting investors for future innovative array designs.

Scope: Design tools for array of wave and tidal energy converters have been developed. Single devices have already been deployed and the first arrays are planned for 2016 onwards. Based on the experience with the first ocean energy arrays the design tools can be developed further and a 2nd generation of advanced tools is foreseen which will have a significant positive effect on future devices and arrays. The impact of design on energy yield, survivability and O&M as well as environmental impacts should be taken into account. These tools should facilitate a significant increase in reliability, survivability, performance improvement and cost reduction of devices and arrays.

TRL 6 shall be achieved at the end of project activities.

The action should clearly include an (economic) analysis of supply chains and (potential) markets and assess economic feasibility, develop a cost-benefit methodology and propose pricing methods. Eventually new or improved business and management models can be proposed.

Proposals should aim to critically evaluate relevant legal, institutional and political frameworks and ask how, why and under what conditions these could act as a barrier or an enabling element for future deployment of ocean energy.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 7 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The action will reduce the technological risks for the next development stages, significantly contribute to an increase in technology performance, increase reliability and lifetime, while decreasing operation and maintenance costs, reduce the life-cycle environmental and socio-economic impacts, and reduce ocean energy technology installation time and cost and/or operational costs, hence easing the deployment of ocean energy sources within the energy mix.

The new design tools will eventually result in more cost-effective arrays and hence will reduce the cost of energy. It is expected that as a result of this action ocean energy would become more commercially attractive for investors.

The action should also contribute to the strengthening the European industrial technology base, thereby creating growth and jobs in Europe.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-17-2017: Easier to install and more efficient geothermal systems for retrofitting buildings

Specific Challenge: The cost and efficiency of existing geothermal systems, mostly based on vertical wells, to provide heating and cooling in buildings being retrofitted or renovated are not very competitive in particular when digging is difficult. The challenge is to demonstrate the cost-effectiveness and efficiency of geothermal systems for heating and cooling in individual installations being retrofitted.

Scope: Proposals shall target easy to install and efficient underground coupling systems for retrofitting existing types of buildings or adaptable to existing types of buildings, including historical buildings, to make geothermal energy a standard source of heat and cold in building renovation. The difficulties in drilling in built environments must be taken into consideration and properly addressed. Proposals might address the need for improved and more cost-efficient heat pumps to optimize the use of the energy generated by the proposed geothermal system. Synergies may be considered with activities initiated under the Energy Efficiency call topics EE-10-2016 and EE-11-2016.

TRL 7 shall be achieved at the end of the project.

This topic will contribute to the PPP on Energy-efficient Buildings.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The action will result in the demonstration of geothermal systems, to be used in existing buildings, that make geothermal energy a viable and cost-competitive source of energy for heating and cooling. The demonstrated systems will be easy to install in built environments and have a proved efficiency in different geological conditions. The action will increase the commercial attractiveness of geothermal energy for heating and cooling and therefore increase the penetration of this renewable energy source.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-18-2017: EGS in different geological conditions

Specific Challenge: Geothermal resources at medium-high temperature can produce at competitive costs electricity, heat or a combination of both. Routinely created enhanced geothermal systems (EGS) offer the opportunity to produce geothermal energy throughout Europe, including in locations where natural reservoirs are not available. In order to increase the number of geothermal installations, enhanced geothermal systems (EGS) have to be demonstrated as cost-competitive whereby innovative solutions are needed to allow for applications in geologic systems with different characteristics and of different origin.

Scope: Proposals should aim at testing EGS systems to ensure reservoir productivity in different geological settings and energy production at competitive costs. Proposals could propose up-scaling existing EGS systems.

TRL 7 shall be achieved at the end of project activities.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 to 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The actions will provide the data and the experience required to lower the costs for geothermal electricity and heat production in different geological conditions applying the EGS technology. The action will contribute to increase the penetration of geothermal energy by demonstrating the viability of EGS.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-19-2016-2017: Demonstration of the most promising advanced biofuel pathways

Specific Challenge: It is essential to diversify the technology portfolio and feedstock basis to allow competitive production of advanced biofuels for use in transport.

The following sub-challenges should be addressed:

- a. improving the technical and economic feasibility of the production of new and advanced liquid biofuels;
- b. demonstrating the feasibility of using feedstock particularly suitable for transport energy purposes.

Scope: Proposals shall aim at moving technologies that reached already TRL 5-6 to TRL 6-7 (please see part G of the General Annexes) through industrial demonstration projects in line with the Implementation Plan of the EIBI⁶⁴. Projects should target the most promising advanced liquid biofuel production pathways incorporating new or improved biochemical/thermochemical/chemical conversion together with upgrading technologies and valorisation of co-products that improve the economic viability of the fuel production.

Environment, economic and social issues⁶⁵ including health and safety should be considered in the whole life cycle and appropriately addressed. A methodology that permits robust and reliable assessment of the environmental (notably in terms of GHG performance), economic and social benefits with respect to current technologies should be included.

The proposals should respect the principle of the minimum bioenergy content laid out in the EIBI Implementation Plan: 'At least 70% of the bioproducts produced by the plant shall be bioenergy (biofuels, heat, power) , calculated on energy basis.

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

Proposals should address both sub-challenges described above, while the main effort in 2016 shall be in addressing sub-challenge a) and in 2017 sub-challenge b). Where synthesis gas or

⁶⁴ <http://setis.ec.europa.eu/set-plan-implementation/european-industrial-initiatives-eiis/eii-implementation-plans>.

⁶⁵ For example, will this solution bring positive changes to our lives and society? Will it support socially inclusive growth? What are the positive and negative externalities? Will it boost the creation of jobs and economic opportunities; revitalise the economy?

intermediate energy carriers are produced, their final use for production of advanced biofuels for transport must be demonstrated.

In particular, proposals shall address one of the following:

In 2016:

- Biomass gasification to synthesis gas;
- Biomass pyrolysis and torrefaction to intermediate bioenergy carriers (pyrolysis oils and torrefied biomass);
- Biochemical conversion of lignocellulosic biomass sugars to hydrocarbons for diesel and jet engines;

In 2017:

- Biofuels from the carbon content in flue gases of industrial wastes through biochemical and/or biological conversion;
- Biofuels from aquatic biomass;
- Liquid biofuels from wastes and residues (forest, agricultural, the organic fraction of municipal and industrial wastes).

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators and the expected impacts. Industrial involvement in the consortium and explicit exploitation plans are a prerequisite.

Proposals shall include a work package on the business case of the technology solution and which identifies potential issues of public acceptance, market and regulatory barriers, including standardisation needs. It should also address, where appropriate, synergies between new and existing technologies and other socio-economic and environmental aspects from a life-cycle perspective. Furthermore, they shall address the risks (technological, business, process) and their possible mitigation.

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged.

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 15 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Demonstrating advanced biofuel technologies at large industrial scale reduces the technological risks and paves the way for subsequent first-of-a-kind industrial projects. For this purpose, the scale of the proposals should permit obtaining the data and experience required so that up-scaling to a first-of-a-kind, industrial project can be envisaged

as a next step. Favourable energy and GHG balances are expected. The demonstrated industrial concepts should ensure the techno-economic feasibility of the entire value chain and have the potential for a significant social and economic impact, notably in terms of job creation, economic growth and safe and affordable energy supply.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-20-2016-2017: Enabling pre-commercial production of advanced aviation biofuel

Specific Challenge: Decarbonisation of the aviation transport sector and reducing its dependence on fossil fuel requires liquid biofuels even in the longer term. Accelerating the deployment of advanced biofuel technologies for use in aviation will allow competitive production of biojet fuels on commercial scale, increase their attractiveness and facilitate achievement of the EU Biofuel FlightPath⁶⁶ targets. Therefore, the specific challenge is to enable commercial production of sustainable and cost-competitive advanced biofuels aimed for use in the aviation sector. In particular, supporting the accomplishment of pre-commercial plant(s) for advanced biofuels for aviation based on sustainable biomass feedstock is essential.

Scope: Proposals shall aim at moving technologies that have already reached TRL 5-6 to TRL 6-7 through novel industrial demonstration projects which support the innovative integration of production processes for advanced biofuels for aviation into first-of-a-kind or existing industrial scale plants. Projects should target the most promising advanced aviation biofuel production pathways incorporating upgrading technologies and valorisation of co-products that improve the economic viability of the fuel production. The ultimate production target of aviation biofuel for the complete plant shall be in the range of several tens of thousand tonnes per year. The aviation biofuel must be fully compliant with international aviation fuel standards and therefore suitable for commercial flight operations. Where relevant, projects should also make use of existing infrastructures for transportation, logistics, and fuelling for performing commercial flights with the produced fuel. Relevant datasets shall be collected for these operations.

Environment, economic and social issues including health and safety should be considered in the whole life cycle and appropriately addressed. A methodology that enables robust and reliable assessment of the environmental (notably in terms of GHG) performance, economic and social benefits with respect to current technologies should be included.

In addition, proposals shall address the entire value chain including the supply chain of sustainable biomass feedstock and the actual use of the produced biofuel in aviation.

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

⁶⁶ http://ec.europa.eu/energy/sites/ener/files/20110622_biofuels_flight_path_launch.pdf
<http://ec.europa.eu/transport/modes/air/doc/flightpath2050.pdf>

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators and the expected impacts. Industrial involvement in the consortium and explicit exploitation plans are a prerequisite.

Proposals shall include a work package on the business case of the overall business solution and which identifies potential issues of public acceptance, market and regulatory barriers along the entire value chain. It should also address, where appropriate, synergies between new and existing technologies and other socio-economic and environmental aspects from a life-cycle perspective. Furthermore, they shall address the risks (feedstock, technological, business, process) and their possible mitigation. A signed off-take agreement with one or more airlines or alternative similar agreements should be envisaged in the proposal. In the event of a grant award the off-take agreement must be signed before signature of the grant agreement.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 to 15 million in 2016 and 5 to 10 million in 2017 would allow this specific challenge to be addressed appropriately while maximizing the acceptable production pathways. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Demonstrating advanced biofuel technologies for aviation at large industrial scale will respond to the EU FlightPath objectives for commercial deployment and realisation of aviation biofuels and its target of using 2 million tons aviation biofuel by 2020. Favourable energy and GHG balances are expected. The demonstrated industrial concepts should ensure the techno-economic feasibility of the entire value chain and have the potential for a significant social and economic impact, notably in terms of job creation, economic growth and contribution to the decarbonisation of the aviation sector in addition to supporting advancement of the regulatory framework.

Type of Action: Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

SUPPORTING THE MARKET UPTAKE OF RENEWABLE ENERGY TECHNOLOGIES

LCE-21-2017: Market uptake of renewable energy technologies

Specific Challenge: Since the adoption of RES Directive in 2009⁶⁷, most Member States have experienced significant growth in renewable energy consumption and the EU and large majority of Member States are on track towards 2020 RES targets. Considering Member

⁶⁷ 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

States' current and planned policy initiatives, their current implementation rates and the various barriers to renewable energy development, the need for improvements for some RES technologies, like offshore wind, advanced biofuels, CSP and geothermal, however, becomes apparent.

To ensure the level of growth needed to deliver the technology deployment rates at least to the level planned in the National Renewable Energy Action plans and their necessary contribution to the 2020 RES targets. EU targets for renewable energy, and to create the appropriate business environment for EU industrial leadership in low-carbon energy technologies, a number of important market-uptake challenges need to be addressed.

Scope: One of the following technology-specific challenges has to be addressed:

1. **Photovoltaics:** *Tackling the bottlenecks of high penetration levels of PV electricity into the electric power network:* PV electricity is not necessarily generated when mostly needed. Furthermore, small distributed PV systems feed into the grid possibly all at the same time challenging grid stability. To enable the effective and efficient integration of growing shares of PV power into the grid, the idea of PV producers becoming “prosumers” – both producers and consumers of energy – is gaining ground while “self-consumption” is becoming a major driver for the installation of small distributed PV systems. To facilitate this to happen, the following sub-challenges need to be addressed:
 - a. Development of solutions for innovative system-integration and power-management for households/larger buildings (in general small distributed PV systems) including storage, particularly addressing the impact of self-consumption on the operation of the grid and the value of PV electricity when aggregated and offered to the wholesale market;
 - b. Based on these solutions, elaboration of business and management models, including cost-benefit analysis and assessing economic feasibility for the European urban landscape.
2. **Heat Pumps:** *Accelerate the penetration of heat pumps for heating and cooling purposes:* Heating and cooling represents almost 50% of the final EU energy consumption and cooling demand is increasing. The cost associated with the purchase and installation of heat pumps remains an obstacle for a wider penetration on the market. In order to accelerate the penetration of heat pumps for heating and cooling purposes, proposals should address the following challenges:
 - a. identification of the most promising cost reduction options for CAPEX, installation costs, and OPEX as well as development of EU wide scenarios of deployment; proposed prioritisation of R&I investments;
 - b. development of solutions for innovative system integration and integrated power management for household/industrial buildings.

3. **CSP:** *Facilitating the supply of electricity from CSP plants in Southern Europe to Central and Northern European countries* - By means of CSP Southern European countries could supply renewable electricity on demand to the entire European energy market, including Central and Northern European countries – in particular, the Renewable Energy Directive foresees cooperation mechanisms to this end to allow Member States to meet their national targets cost-efficiently. The exploitation of this possibility would greatly facilitate the market uptake of CSP, but this has not happened so far. The challenge is to identify all issues (technological, legal, economic, political, social, financial, etc.) that may constitute an obstacle to the supply of renewable electricity on demand from CSP plants to Central and Northern European countries (other than those bottlenecks related to building new physical interconnections), and to provide options for addressing them in the context of a concrete project case.
4. **Wind energy:** *Increasing the market share of wind energy systems:* One of the following specific sub-challenges need to be addressed: i) Develop spatial planning methodologies and tools for new onshore wind and repowering of old wind farms taking into account environmental and social impacts but also the adoption of the latest developments in wind energy technology; ii) Identify the bottlenecks for further deployment in Europe and the regulations which limit the adoption of technological innovation and their deployment possibilities; iii) Increase the social acceptance and support for wind energy in 'wind energy scarce regions' using, with solid involvement of social sciences and humanities and local communities and civil society to understand best practices and to increase knowledge about social and environmental impact of wind energy.
5. **Geothermal energy:** *Tackling the bottlenecks of high penetration levels for geothermal energy systems:* Geothermal energy suffers from a level of penetration that is limited compared to its potential and there are growing concerns regarding the environmental and the social impact of geothermal installations. The challenge is to remove environmental and social concerns that pose barriers limiting the contribution of geothermal energy to the energy mix. The challenge is to assess the nature of public concerns and the elements that influence individual and group's perception of geothermal installations, to increase the understanding of the socio-economic dimension of geothermal energy, and to promote change in community responses to new and existing geothermal installations. Different technologies and possible technological solutions, with particular reference to reinjection of incondensable gases in deep geothermal plants, are key elements of the environmental and social impact assessment. Specific challenges related to deep and shallow geothermal energy require separate considerations. Risk management strategies and adequate technology selection, for example induced seismicity or emission reduction should be addressed, when relevant.
6. **Sustainable Fuels:** *Facilitating the market roll-out of liquid advanced biofuels and liquid renewable alternative fuels:* The challenge is to enable commercialisation of advanced biofuels to help meeting the 10% target for Renewable Energy Sources in the

EU transport energy consumption by 2020 and then contribute to the EU targets of 27% share of Renewable Energy Sources in the EU energy consumption and of 40% GHG reduction by 2030. Fossil fuels and biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded. Proposals shall address one or several of the following sub-challenges:

- a. Development of tools for predicting the fuel cost in relation to different supply and demand scenarios taking into account technology performance, economies of scale, feedstock costs, market demand, socio-economic aspects, etc. and including sensitivity analysis through conceptual engineering and cost estimation for the most common conversion routes;
- b. Development and implementation of innovative crop rotation schemes for the production of lignocellulosic biofuels with improved sustainability;
- c. Development of numerical tools for prediction of fuel and fuel blend properties and model validation to facilitate the certification process in the transport sector;
- d. Development of communication strategies to increase the public acceptance for advanced biofuels for the most common conversion routes;
- e. Setting up sustainable and cost-effective European biomass supply chains for the industrial production of advanced biofuels;
- f. Actions aiming at development and implementation of common standards and certification schemes for fuels at EU-level;
- g. Actions aiming at harmonization of national standards and certification schemes for fuels at a European level;
- h. Development of tools and actions for capacity building among relevant stakeholders of all steps in the advanced biofuel value chain aiming at substantially reducing biofuel costs at large scale.

Proposals should address one of the sectorial technology challenges mentioned above. The complexity of these challenges and that of the related market uptake barriers calls for multi-disciplinary research designs, which may include contributions also from the social sciences and humanities. Regional specificities, socio-economic, spatial and environmental aspects from a life-cycle perspective shall be considered. For all actions, the consortia should involve and/or engage relevant stakeholders and market actors who are committed to adopting/implementing the results. Where relevant, proposals should also critically evaluate the legal, institutional and political frameworks at local, national and European level and how, why and under what conditions these (could) act as a barrier or an enabling element.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 to 3 million would allow this specific challenge to be addressed appropriately.

Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: It is expected to increase the share of renewable energy in the future energy mix and to increase the share of sustainable advanced biofuels and renewable alternative fuels in the final EU transport energy consumption or facilitate those increases in the future. In addition, contribution to market understanding for possible policy and regulatory development is anticipated.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

FOSTERING INTERNATIONAL COOPERATION IN THE AREA OF RENEWABLE ENERGY

LCE-22-2016: International Cooperation with Brazil on advanced lignocellulosic biofuels

Specific Challenge: The coordinated call aims at exploiting synergies between Brazil and Europe in terms of scientific expertise and resources in topics related to advanced biofuels by implementing coordinated projects.

One of the following sub-challenges should be addressed by the proposals:

- a. Gasification of bagasse to syngas and advanced liquid fuel production, including biofuels for aviation.
- b. Applied research to biomass production logistics and applied research for feedstock diversification for advanced biofuels.
- c. Development of new fermentation and separation technologies for advanced liquid biofuels and applied research to increase the energy efficiency of advanced biofuel processes.

Scope: Proposals shall aim at moving technologies from TRL 3-4 to TRL 4-5

Biofuels produced from starch, sugar and oil fractions of food/feed crops are excluded.

Joint work can - where relevant - build upon the Brazilian sugarcane ethanol model, and should benefit from the Brazilian and European experience in biofuels.

Proposals should address, where appropriate synergies between new and existing technologies, regional approaches and other socio-economic and environmental aspects. A life-cycle analysis shall be performed.

The exploitation of results, including IPR, should be appropriately addressed in the proposal.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3-5 million would allow the specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Furthermore, a balanced effort between Europe and Brazil regarding the two coordinated projects is expected..

Aligned Brazilian and European projects shall have the same start date, the same duration – up to 5 years, same targets, and must demonstrate clearly how the coordination among them will bring added scientific value. To ensure a project implementation that reflects a genuine EU-Brazil cooperation, priority in evaluation will be given to proposals involving properly coordinated research activities between Europe and Brazil in the research plan of the two coordinated projects. Independent projects, which are not aligned, will be considered ineligible. Proposals will include detailed explanations about tasks and effort of the coordinated proposal as a whole and cross-references to the other part of the proposal.

Proposals will be only selected on the condition that the corresponding coordinated project is also selected for funding.

Demonstration of co-funding for the research from industry sector is desirable on both sides.

The Brazilian funding organisation for this topic is *São Paulo Research Foundation* (Fundação de Amparo à Pesquisa do Estado de São Paulo, FAPESP, <http://www.fapesp.br/en/>). For more details please refer to the Frequently Asked Questions.

Expected Impact: A significant progress in the specific sub-challenges mentioned above should be obtained by benefiting from the complementarities of expertise and experience in EU and Brazil. Moreover, the cooperation between key researchers, institutions and industries that are active in biofuel research in EU and Brazil should be strengthened.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-23-2016: International Cooperation with Mexico on geothermal energy

Specific Challenge: Mexico and Europe have high potential for geothermal energy generation; in particular the Mexican geothermal resource settings provide a unique opportunity to apply and further develop methodologies and technologies in the field of EGS (Enhanced Geothermal Systems) and of superhot systems. Cooperation activities are proposed in the framework of the Bilateral Agreement on Science and Technology between the European Union and the United States of Mexico.

The challenge is to increase knowledge and expertise to reduce technological and social risks associated with the development and exploitation of EGS and superhot geothermal fluids. For

EGS, issues such as long-term productivity and unwanted side effects, such as induced seismicity, need to be controlled. In superhot systems the geothermal community needs more experience to address the specific challenges arising from the very hot fluids. These challenges include reliable characterization of the geothermal potential and the interaction of these very hot fluids with subsurface and surface installations. Scientific challenges to be addressed include: prediction of chemical and geological properties and their effect on geothermal operations; advanced fracture characterization technologies to determine the ideal exploitation scheme; identification of ideal areas for locating deep wells; high temperature well-logging tools and sensors; smart (high temperature) tracers.

Scope: The development of unconventional geothermal systems such as EGS and superhot geothermal resources (including those above the critical point of water) needs further validation and demonstration in specific high-temperature geological environments. Mexico is chosen for testing and developing these technologies further in a relevant geological environment. The focus should be on establishing an inventory of the expanded resource base and on the development of test sites in specific locations.

Proposals shall aim at moving from TRL 3-4 to TRL 4-5.

Beyond the appropriate regional approach in Mexico, generalised environmental aspects and public acceptance concerns need to be addressed in every phase of the project. Transfer of the knowledge gained to different areas should be pursued. Exploration studies will be performed to provide a comprehensive knowledge of the sites and applied to meet the specific challenges highlighted above.

Proposals requesting a contribution from the EU of around EUR 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The project is expected to progress in the technology development applying and consolidating concepts and technologies in different geological contexts therefore reducing technological and social risks of geothermal developments. The project will promote innovation and technological development in Mexico, establishing a reliable scientific framework to increase the number of commercial geothermal activities. In the project context a strengthening of the European geothermal technology base is also expected, expanding European market for geothermal technologies and creating growth and jobs. Scientific exchange of researches and capacity building are envisaged as an indirect project impact.

Proposals should appropriately exploit the complementarities between the EU and Mexico, and pave the way for significant enhancement in the cooperation between researchers and research institutions.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

3. ENABLING THE DECARBONISATION OF THE USE OF FOSSIL FUELS DURING THE TRANSITION TO A LOW-CARBON ECONOMY

The final content of the area '*Enabling the decarbonisation of the use of fossil fuels during the transition to a low-carbon economy*' for 2017 will be decided at a later stage, depending on the developments with on-going European industrial CCS demonstration. If the ERA-NET Co-Fund for industrial-scale demonstration will be published, the topics on 'CCS in industry' (LCE 29 – 2017) and 'Geological storage pilots' (LCE 30 – 2017) will be withdrawn due to budgetary constraints.

Proposals are invited against the following topic(s):

LCE-24-2016: International Cooperation with South Korea on new generation high-efficiency capture processes

Specific Challenge: The wider deployment of CCS requires a significant reduction of the energy intensity of the capture process for power plants or other energy-intensive industries, and a substantial decrease of the cost of capture. Basic research and proof of concept is needed for novel and efficient capture technologies for application in power production and industrial process.

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 Dry Sorption Process, Membrane, and Wet sorption process. Environmentally benign technologies should be pursued and their environmental impact addressed in the project also in view of future scaling up. Projects shall include prototype testing under industrially relevant conditions. Any research that constitutes a technology demonstration at large scale or a combination of CCS technologies proven at pre-demonstration pilot scale will not be considered for funding.

With a view to promoting international cooperation with South Korea, initiatives for collaboration between the EU project(s) to be selected under this topic and the endorsed South Korean project(s) will be required on the basis of mutual benefit and reciprocity. Specific budget needs to be allocated in the EU project for pursuing such twinning activities (e.g. exchange of information, exchange of researchers). The Commission reserves the right to ask the coordinators of Horizon 2020 projects, during the grant preparation, to include further collaboration activities endorsed by the Korean Ministry of Science, ICT and Future Planning (MSIP).

Focus should be on progressing technologies that already reached TRL 2-3 to TRL 4-5.

A related activity is supported under topic NMBP 22-2017: "High-performance materials for optimizing CO₂ capture", included in the work programme of 'Leadership in enabling and

industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing', in which the focus is capitalising on promising material solutions for the next generation CO₂ capture technologies.

Proposals requesting a contribution from the EU of between EUR 2 to 5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Significant reduction of the energy penalty of the whole capture process for power plants or other energy-intensive industries, and thus a considerable decrease of the fuel-dependent cost of capture; substantial reduction of the capital cost and of the operational and maintenance (O&M) costs (fixed and non-fuel variable costs) compared to existing technologies.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-25-2016: Utilisation of captured CO₂ as feedstock for the process industry

Specific Challenge: Capture of CO₂ from power plants or industrial processes and subsequent utilisation through (bio-) chemical transformation into high-volume added value products (CCU) can be an alternative to geological storage which could provide an important cost reduction to the entire CO₂ sequestration process. CO₂ utilisation has the potential to contribute to reducing greenhouse gas emissions if the CO₂ replaces manufactured CO₂ or the resulting product provides long term abatement of the CO₂, or if CO₂ replaces fossil fuels as raw materials, depending on the amount of extra energy used in the process. In addition, the conversion of CO₂ into fuels could provide opportunities for energy storage and for higher security of fuel supply.

There are still relevant and significant scientific and technological challenges to be able to exploit the CO₂ as a chemical and fuel feedstock in a systematic manner. Therefore, it is necessary to demonstrate the feasibility of such CO₂ utilisation technologies to produce added value products at larger scale, in an operational environment to be able to assess the industrial, economic and environmental potential of such technologies.

Scope: In the context of energy research, the focus will be on CO₂ utilisation options that have the potential to yield a significant, net reduction of CO₂ emissions in volumes sufficient to make a meaningful contribution to our climate change objectives. The use of CO₂ for enhanced oil recovery is out of scope of this topic. Projects should address the specific technology needs for capture and purification of CO₂ emitted by the power or process industry to deliver the desired concentration and purity for the subsequent conversion process. Technology developments must be accompanied by a Life-Cycle-Assessment (LCA) study, identification of appropriate business model and measures to support market up-take.

Proposals should address innovative processes to produce high-volume added value products from CO₂ and demonstrate the technical and economic feasibility in an industrially relevant environment through demonstration of a system prototype. The proposed technologies should also consider the energy balance and the type of energy required for CO₂ transformations, the CO₂ abatement potential (in terms of time-scale and volume) and process sensitivity to flexible (intermittent) operation. The implementation of this proposal is intended to start at TRL 5-6 and target TRL 6-7. An indication and justification of the current TRL as well as a plan to reach the targeted TRL should be part of the proposal.

This topic is contributing to the PPP “SPIRE” (Sustainable Process Industry through Resource and Energy Efficiency).

Related activities are supported under the topic SPIRE 08-2017: 'CO₂ Utilisation to produce added value chemicals' and NMBP 21-2017: 'Cost-effective materials for “power-to-chemical” technologies for materials aspects', both included in the work programme of 'Leadership in enabling and industrial technologies – Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing'.

The Commission considers that proposals requesting a contribution from the EU between EUR 6 and 10 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Demonstration, in the relevant environment and scale, of the technical and economic feasibility of novel and environmentally friendly processes for CO₂ conversion to high-volume added-value products such as chemicals and/or fuels. Reduction of the emissions of greenhouse gases on full LCA basis. Significant decrease of the cost of CCU vs. CCS. Improved energy and resource intensity with respect to conventional manufacturing of the same product. These impacts must be quantified and justified.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-26-2016: Cross-thematic ERA-NET on Applied Geosciences⁶⁸

Specific Challenge: The increasing use of subsurface resources resulting from growing energy needs and the growing demand for water and raw materials represent key challenges, requiring a more integrated, efficient and sustainable use of these resources, and the minimisation of any negative health and environmental impacts. Synergies should be nurtured, while conflicts of use should be avoided. This creates at the same time significant

⁶⁸ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners and earth observation networks is excluded from the delegation to INEA and will be implemented by the Commission services.

opportunities in terms of growth and job creation in advanced technology sectors related to the optimal management and use of the resources. This topic addresses three specific challenges that are highly relevant to the sustainable use of the subsurface: Geo-energy, Groundwater and Raw Materials.

a. Geo-energy:

With regards to Geo-energy, information is needed on:

- The potential contribution from the subsurface (i.e. access to primary energy sources, energy storage potential and storage capacity for CO₂ captured from fossil fuel power generation and/or industry)
- Potential risks and environmental impacts associated with subsurface use for energy applications
- Potential competition and interference of different (energy and other) applications within the subsurface and interactions with surface infrastructures and uses.

Information on the European subsurface must be available and accessible to society in order to enable the more efficient and sustainable use, more integrated management and spatial planning of the subsurface and the energy resources, groundwater and raw materials it contains. This requires setting up a Pan-European database of harmonised and scientifically robust digital information of the subsurface and its potential uses in the field of geo-energy. The use and implementation of the database should be clearly defined and based on common agreed principles.

a. Groundwater:

Groundwater resources and the subsurface in general are increasingly used for a wide range of applications and therefore under pressure. Groundwater resources are threatened by climate change, pollution and water abstraction. There is a clear need to assess the impact of these drivers on the groundwater resources, their inter-linkage with surface water resources and the groundwater dependent terrestrial and associated aquatic ecosystems including coastal waters; as well as the built environment and rural and urban land use.

Modern technologies allow characterisation and visualisation of groundwater bodies; simulation of potential pathways and groundwater flow velocities; assessment of temporal and spatial trends in groundwater quality and quantity; and assessment of their impact on and interaction with surface waters. Such work both provides and requires information and knowledge of physical, chemical and hydraulic parameters on the European subsurface. These data must be available and easily accessible for all relevant end users to enable proper water resource management and integrated surface and subsurface spatial planning and assessments.

a. Raw Materials:

The EU Raw Materials policy aims to ensure the sustainable supply of non-energy raw materials from the EU and global sources, including metallic and industrial minerals, as well as construction materials (dimension stones and aggregates).

Supply from the EU sources requires harmonized and standardized EU level data and information on raw material deposits, as well as on mine-wastes materials - such as by-products, waste rocks, tailings and residues – that could be recycled and re-used. Discovery of new resources needs enhanced information and ore deposit models in exploration and resource assessment to focus increasingly on deeply buried deposits, as well as on mineral deposits on or below the sea-floor.

Such EU level data and information do not exist at the moment. However, there is relevant knowledge of mineral deposits at the Member States level with heterogeneous terminology and reporting standards.

There is also a need for European sustainable sub-surface planning and use that should be based on documentation and spatial databases of deposit and high-potential exploration areas.

Scope: Proposals should pool the necessary resources from national (or regional) research programmes with a view to implementing a joint transnational call for proposals with EU co-funding. The action is targeted at publically funded research performing organisations. Their participation must be mandated by the national/regional authorities in charge (normally the responsible Ministry). The co-funded call for proposals must be based on in-kind contributions from their institutional funding and the beneficiaries will carry out the transnational projects resulting from their call for proposals fully or partially themselves.

GIS-based databases shall be developed with a view to, in the longer term, the operation and maintenance of an integrated database and map of the European underground, its resources (geo-energy, groundwater and raw materials) and its potential uses. Where appropriate, synergies and compatibility with the EPOS research infrastructure is required and will ensure that developed databases, tools and models can serve the largest communities. The database shall be INSPIRE compliant and be compatible with energy minerals data and marine maps (EMODnet) for the proper land planning and use of both surface and sub-surface. Furthermore, databases should have the technical specifications so that they can be potentially hosted by the European Commission.

Geo-energy:

In the field of geo-energy, the ERA-NET shall collate, interpret and produce reliable and impartial scientific information on geologically based energy resources and potential environmental and climate consequences related to their potential exploitation (e.g. hazards, risks, interference, synergies, conflicts of use), including conventional and unconventional⁶⁹

⁶⁹ The ERA-Net should take account of work done under the action Energy WP2014/2015 B.2.9- Energy Policy Support on Unconventional Oil and Gas (Administrative Arrangement JRC N °33565). Any duplication shall be avoided.

oil and gas, coal, coal bed methane (CBM), gas hydrates, geothermal resources and uranium, as well as CO₂ storage and energy storage (note that certain resources are of local relevance only such as for example gas hydrates and uranium). This includes developing state-of-the-art methodologies and workflows focusing on efficient cross border and integrated pan-European resource mapping and assessment, both onshore and offshore. Specific site investigations are excluded from the ERA-NET scope.

Deliverables should among others comprise online atlases of geo-energy related resources; their properties essential for assessing feasibility, performance and behaviour; maps and cross-sections of main structural elements and faults.

a. Groundwater:

In the field of groundwater, research should develop and enhance the knowledge and the predictive capacity needed to assess the impact of climate change and human activities on groundwater resources and dependent surface waters and ecosystems, and the consequences for groundwater quantitative and chemical status assessed according to the Water Framework and Groundwater directives. High quality models including estimated simulation and projection uncertainties are required tools for decision support systems that allow e.g.:

- Elaboration of cost-effective measures and assessment of their (cost) effectiveness;
- Sustainable decision making taking into account the water-food-energy nexus;

The ERA-NET will contribute to:

- State-of-the-art resource mapping and assessment that will set the basis for an integrated Europe-wide monitoring system of groundwater in line with the Water Framework Directive;
- Integrated groundwater and surface water assessments, simulations and projections both at local/regional and transnational (large river basins) scale.

Deliverables shall include:

- Improved tools and models for subsurface characterisation, risk assessment and assessment of the impact of climate change, human activities and other uses of the subsurface on groundwater resources and dependent terrestrial ecosystems;
- 3D maps of groundwater resources;
- Temporal and spatial groundwater pollution trends including diffuse pollution of especially nutrients (N, P) and pesticides from agriculture, trends in nutrient loadings to ecosystems, and fate, behaviour and degradation of emerging pollutants from industry, households and agriculture, and the resulting impact on dependent terrestrial ecosystems;
- Groundwater and surface water flooding risks;

- Saltwater / seawater intrusion and the resulting impact on dependent terrestrial ecosystems;
- Groundwater abstraction needs for water supply and irrigation and the resulting impact on dependent terrestrial ecosystems (including soils), surface waters, and groundwater associated aquatic ecosystems, the groundwater ecosystem itself, and the built environment (e.g. damage of infrastructure due to land subsidence)

a. **Raw Materials:**

The Raw Materials specific challenge shall address non-energy non-agricultural raw materials and minerals, and shall address all 28 EU Member States⁷⁰.

The ERA-NET shall, through intelligence networking and coordination, enhance and maintain the pan-EU mineral deposits inventory/database, in line with and building on existing activities in the framework of the EIP on Raw Materials. It shall provide economic geology maps of construction materials and industrial and metallic minerals across the EU 28 Member States in a free publicly accessible Internet/web-portal form. The ERA-NET shall also deliver a pilot study identifying targets for general exploration, using innovative technologies and challenging a better understanding of ore genesis and direct exploration at deeper, unexploited levels of the Earth's crust.

Deliverables shall include:

- Pan-EU mineral deposits inventory
- The deposits inventory will be developed with a view, in the longer term, to create an integrated geographical database and a mineral resources map of the European sub-surface and its potential development and uses.
- The inventory should build upon national and regional level databases and past and ongoing EU funded projects providing better insight into the distribution of known mineral raw material resources.
- The use of standardized and harmonized pan-European datasets of primary and secondary resources (land and marine) will contribute to enhancing investment conditions for the mining industry.
- Digital Annual Minerals Yearbooks covering the territory of at least all 28 EU Member States.
- Pilot Study:

- The Pilot study should identify targets for general exploration and further governmental spending, which is necessary to attract private investment into detailed exploration and mining across the whole EU. This can be achieved by developing and applying innovative exploration technologies (3D/4D) to locate deep-seated deposits. The pilot study should deliver high-quality metallogenetic, mineral potential and predictivity maps - which may lead to discovery of new or little-known types of ore deposits and ore-forming systems, including of critical raw materials, in specifically targeted areas.
- Results of the pilot study will feed into the EU mineral deposits inventory, and will set the stage for follow-up activities.

Expected Impact: Improved interoperability of data and information, thus allowing a uniform, unbiased and independent insight in the distribution of identified and prospective geo-energy, groundwater and raw materials resources. Better understanding and management of the water-energy-raw materials nexus through a more integrated and efficient management and exploitation (and more responsible and publicly-accepted use) of subsurface resources for the various uses, while reducing any associated potential impacts and risks.

Type of Action: ERA-NET Cofund

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-27-2017: Measuring, monitoring and controlling the risks of CCS, EGS and unconventional hydrocarbons in the subsurface

Specific Challenge: Carbon capture and storage (CCS), enhanced geothermal systems (EGS) and unconventional gas development impact on the subsurface. Subsequently, advanced and cost effective monitoring of the containment of underground CO₂ and natural gas is vital for the sustainable management of the subsurface and its resources.

In CCS, the safe and permanent geological storage of CO₂ requires a continuous and sophisticated monitoring of the storage complex. For enhanced geothermal systems, the use of supercritical CO₂ has been proposed as a circulating heat transmission fluid. The CO₂ would bring the advantage of a low viscosity and hence low flow resistance as compared to water, and could achieve permanent storage of CO₂ as a supplementary benefit. In both CCS and EGS, robust monitoring is a key prerequisite for the safe and sustainable storage or circulation of significant volumes of CO₂ in the subsurface.

Technological progress, in particular the combination of horizontal drilling with multiple stages of hydraulic fracturing, has enabled the development of unconventional hydrocarbon resources. This has resulted in new opportunities, but also bears environmental and public health risks, which need to be better understood, monitored, managed and communicated appropriately. These risks relate mainly to water pollution (in particular stemming from insufficient underground characterisation, inappropriate well casing, the use of chemicals in

the fracking process, and waste management), but also air emissions as well as local impacts linked in particular to transport, land and water use.

Research is needed to better understand and quantify possible (natural and engineered) leakage pathways for natural gas, the rates of leakage into aquifers and escape at surface, the impacts that leakage can have on fresh groundwater resources, soil and biodiversity, and the time frame in which emissions will return to baseline values. In addition, the effective detection and quantification of leakage requires a scientifically robust method for determining natural background concentrations of CO₂ and natural gas in the soil and at the surface.

Uniform, unbiased and independent data are needed to improve environmental stewardship in all three aforementioned geo-energy applications.

Scope: The exact scope of this topic will be further specified in the course of 2016, taking account of, *inter alia*, the review of the effectiveness of the Commission Recommendation of 22 January 2014 on minimum principles for the exploration and production of hydrocarbons (2014/70/EU) (such as shale gas) using high-volume hydraulic fracturing, as well as preliminary findings from four projects on environmental impacts of unconventional gas funded under Horizon 2020 2014-2015 Work Programme.

Expected Impact: To be further specified in the course of 2016. This topic may provide European and North American researchers with a platform to enhance and deepen transatlantic dialogue on environmental and public health issues related to these three applications.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-28-2017: Highly flexible and efficient fossil fuel power plants

Specific Challenge: The share of energy produced from renewable resources is growing rapidly. The output of wind and solar power is highly variable, and depends of factors such as weather conditions and time of day. With this growing share of renewable power, in particular when having priority access to the grid, fossil fuel power plants will have to increasingly shift their role from providing base-load power to providing fluctuating back-up power to meet unpredictable and short-noticed demand peaks, in order to control and stabilise the grid. Plants should be able to run both at the lowest part load possible at the highest possible efficiency. Moreover, plants will be required to operate across the entire load range with high load-change velocities, and even operate in start/stop mode with full turndown and very fast re-start, all at minimal (lifetime) fuel consumption. This forces base-load plants to operate through significantly more thermal cycles, leading to increased rate of wear on plant components. Operational flexibility therefore presents a significant challenge for fossil fuel power (and CHP) plants.

Scope: Focus on progressing solutions that already reached TRL 3 to TRL 4-6 and offer the highest potential for a deeper integration into an advanced energy system with ever higher shares of renewable energies, for both existing (retrofitting) and new thermal power plants. Solutions with lowest greenhouse gas emissions, residue disposal and water need per energy unit are preferred. Collaboration with power plant operators is strongly encouraged. Support will not be given to projects that provide performance improvements that are not related to load fluctuations.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3 to 6 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Projects should lead to innovative and cost-effective solutions to improve the ability of new and/or existing dispatchable thermal power plants to meet fast load changes, in order to better support the grid due to fluctuations in energy peak demand and power output from renewable sources, at minimal fuel consumption and emissions, while mitigating the effects of cycling operation to avoid excessive wear and service life expenditure, and not impeding the potential CO₂ capture readiness of the power plants.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-29-2017: CCS in industry, including Bio-CCS

Specific Challenge: The application of CCS to industrial sectors other than power (e.g. steel, cement, refining) is expected to deliver half of the global emissions reduction from CCS by 2050. In the near future, these industrial applications will open up new opportunities and avenues for CCS that can accelerate its deployment. Also, Bio-CCS technologies have the potential of leading to CO₂ negative emissions. Integrating CCS technology in the best possible way so as to optimise the use of energy in the capture process, minimise process efficiency losses, achieve a suitable CO₂ purity for transport and storage, and maintain the quality of the industrial end product, is a particular challenge.

Scope: Piloting under realistic conditions is required to significantly lower the energy penalty and capture costs. Projects must include activities to explore (possibly shared) local or regional transport and storage needs and solutions.

Focus should be on progressing technologies that already reached TRL 4-5 to TRL 7.

Environmentally benign and cost-effective technologies should be pursued.

Collaboration with industrial end users is essential.

In line with the strategy for EU international cooperation in research and innovation⁷¹, international cooperation is encouraged, in particular with China.

Knowledge sharing with a wide range of stakeholders, as well as early and sustained engagement and involvement of concerned communities through targeted information and dissemination activities, is essential.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 4 to 9 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The cost- and resource-effective application of CCS in industrial operations will expand the available options for CCS and provide a stepping stone to its wider deployment; the concomitant deployment of CCS both in fossil-fuel power production and in energy-intensive industries could facilitate clusters of CCS projects, thereby improving economies of scale for both CO₂ transport and storage. CCS in energy intensive industry can help ensure a competitive position for existing EU industries in a future carbon-restrained world, thus reconciling competitiveness with EU climate goals.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-30-2017: Geological storage pilots

Specific Challenge: The EU is committed to an overall reduction of greenhouse gas emissions of at least 80% by 2050. Nonetheless, fossil fuels will continue to be used in Europe's power generation as well as in other industrial processes for decades to come. Therefore, the 2050 target can only be achieved if the emissions from fossil fuel combustion in the power generation sector and energy intensive industries are eliminated from the system. This will require the application of Carbon Capture and Storage (CCS). A key challenge in the short-term for driving CCS to deployment is the development of geological storage.

Scope: Projects should enable, under "real life" conditions, the development and demonstration of best practices for the entire storage cycle, from site characterisation to operation, including key components of CO₂ transport infrastructure, monitoring and mitigation/remediation of leakage, and including education and training.

Focus should be on progressing technologies that already reached TRL 4-5 to TRL 6.

Knowledge sharing with a wide range of stakeholders, as well as early and sustained engagement and involvement of concerned communities through targeted information and dissemination activities, is essential.

⁷¹ COM(2012)497

In this particular context, new types of interactions between societal actors are encouraged. Projects should identify the key drivers and influencers of public attitude, identify distorted perceptions and develop sound arguments to address them.

International cooperation is encouraged, in particular activities between EU project(s) under this topic and non-EU projects (e.g. from Australia and/or North-America).

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 9 to 16 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: Demonstration of safe and environmentally sound CO₂ storage will play a key role in optimising the safe operation of storage sites and in fine-tuning regulatory issues, in promoting confidence in CO₂ storage and building public awareness of CCS. Pilot-scale demonstration projects should contribute to accelerating the development and deployment of CCS through an enhanced and effective cooperation in research and innovation between various stakeholders and Member States/Associated Countries, thereby allowing a more efficient use and stronger leverage of financial resources and promoting knowledge sharing.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

4. SOCIAL, ECONOMIC AND HUMAN ASPECTS OF THE ENERGY SYSTEM

Proposals are invited against the following topic(s):

LCE-31-2016-2017: Social Sciences and Humanities Support for the Energy Union

Specific Challenge: Completing the Energy Union remains one of the top priorities of the European Commission, and a critical component in Europe's transition towards the decarbonized energy system of the future. Over and above the many technological challenges that need to be overcome on the road to reaching these twin goals, a number of cross-cutting issues need to be better understood, particularly those relating to socioeconomic, gender, sociocultural, and socio-political aspects of the energy transition.

Addressing these cross-cutting issues is crucial to furthering social acceptability of the many changes that the energy transition implies, as well as to better understand why citizens may resist these changes and to devise appropriate mitigating strategies or alternatives.

Of particular importance in this context are the factors that drive individual and collective energy choices and energy-related behaviour, the governance frameworks in which these

choices are made, and the changing roles particularly of consumers and "prosumers" in the energy system.

Scope: Proposals should address one, or a combination, of the following issues (a comparative perspective, with case studies or data from at least three European Union Member States or Associated Countries, will be considered an advantage):

In 2016:

- Factors driving individual energy choices and energy-related behaviour (such as values and ethics, structures of everyday practices, belief systems or social or cultural, notably gender, roles), employing different data-gathering techniques;
- Factors driving collective energy choices and energy-related behaviour (such as social, economic, or other forms of organization or experiences with social mobilization).

In 2017:

- Socioeconomic incentive structures that encourage or discourage energy-responsible behaviour;
- Political, institutional, and organizational frameworks that condition and structure citizen participation, including questions of inclusiveness, gender, democracy, organizational formats and business models.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 4 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The proposed research will

- provide a better understanding of these factors and their interrelations with technological, regulatory, and investment-related aspects which is crucial for the further advancement of the energy transition and ultimately the success of the Energy Union.
- further the completion of the Energy Union and particularly its research and innovation pillar, as well as the continued implementation of the Strategic Energy Technology (SET) Plan and especially the Action Plan based on the Integrated Roadmap.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-32-2016: European Platform for energy-related Social Sciences and Humanities research⁷²

Specific Challenge: The transition to a low-carbon energy system poses a unique set of policy, technological and scientific challenges, as it changes the fundamental nature of the interrelations between all actors in our societies (from energy incumbents to regulators and citizens). Not only there is a need to find novel approaches to the development and application of technological or social processes as they relate to the energy transition, but also to better understand the changes they bring to people's behaviour, pervasive values, cultures of practice and modes of communication.

Since researchers in the Social Sciences and Humanities (SSH) have a particular expertise in analysing and understanding deep change and in designing innovation processes, including social innovations, they must play a stronger role in addressing energy-related challenges. Accordingly, SSH aspects must be better integrated into all stages of the research process.

At present, the energy-related SSH landscape is quite fragmented: there is a lack of exchange among different SSH communities, as well as between these communities and other energy-research disciplines. Creating a platform for better interaction between SSH and other energy-research disciplines would fill an existing gap and contribute to better responding to on-going changes and arising challenges in the energy field.

Scope: Within the scope of this call a platform for SSH research communities in the energy field will be set up at European level, aiming to integrate and build upon the experience of already existing networks and initiatives. The platform will seek to structure and enhance the energy-related dialogue at EU level among the different SSH stakeholders, as well as with other energy-research communities, creating greater inter-disciplinarity and fostering knowledge and information sharing among various disciplines. It will promote the generation of novel, evidence-based research designed to inform and influence relevant policy processes, particularly with respect to the role of SSH aspects (including gender) in hindering or accelerating the transition to a low-carbon energy system in Europe. The platform will also be a source of specific expertise and advice to EU policymakers, such as on how best to embed SSH aspects in Horizon 2020 energy calls, as well as how to address the SSH dimension in EU energy initiatives more broadly.

With a view to addressing specific research and innovation needs in the energy field, and as a principal goal of the platform, a program of activities will be designed. This program will set out how the platform will:

- Consolidate and foster the inter-disciplinary interaction among existing SSH research communities in the energy field, building on the reach and depth of the networks that form part of the submission;

⁷² This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

- Extend and deepen existing networks across different disciplines, involving a variety of stakeholders;
- Reach out to geographic areas in Europe presently not well served in terms of energy-related SSH research and help build capacities there;
- Establish linkages between the new SSH platform and the existing European Technology Platforms (ETPs);
- Better integrate SSH aspects in H2020 energy calls and address the SSH dimension in EU energy initiatives more broadly;
- Formulate a strategic research agenda covering SSH-related aspects in the energy-research field from an inter-disciplinary perspective, with a view to producing relevant, influential, evidence-based research on SSH-related aspects of Europe's transition to a low-carbon energy system.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: The proposal is expected to:

- help deepen, consolidate and broaden the energy research-related SSH communities in Europe;
- trigger and facilitate interdisciplinary dialogue among and between SSH and other energy-research disciplines;
- influence key policy processes in the energy domain by producing novel, evidence-based research on SSH-related aspects;
- provide targeted advice to EU policymakers on how to best embed SSH aspects in H2020 energy calls, as well as how to address the SSH dimension in EU energy initiatives more broadly;
- foster social innovation and social dialogue in the energy field at European level.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

5. SUPPORTING THE DEVELOPMENT OF A EUROPEAN RESEARCH AREA IN THE FIELD OF ENERGY

[Introductory text to be added once the forthcoming Communication on accelerating the European energy system transformation (to be adopted in September) is sufficiently stable to ensure a coherent narrative]

Proposals are invited against the following topic(s):

LCE-33-2016: European Common Research and Innovation Agendas (ECRIAs) in support of the implementation of the SET Action Plan⁷³

Specific Challenge: In view of the profound changes being made to our energy system, there is a crucial need to support and encourage the coordination and convergence of national and EU efforts in addressing research and innovation activities.

The SET Integrated Roadmap⁷⁴ provides a blueprint for how to achieve this convergence. In particular, it identifies priority areas in which Member States and/or Associated Countries are ready to elaborate and define common research and innovation agendas, and priority areas in which they are ready to set up joint projects or programmes.

This initiative aims at supporting joint activities based on European Common Research and Innovation Agendas (ECRIAs). ECRIAs will bring together on a European scale ongoing and future national efforts, so that national activities and their results in areas of significant complexity and importance can be better exploited. This will develop a critical mass of knowledge in sectors which are crucial to achieving the intended energy transition.

Scope: Proposals will first describe how to define a common research and innovation agenda (i.e. an ECRIA) between national activities in areas identified in the SET Integrated Roadmap. The agenda will consist of a limited number of research topics related to an integration aspect of the energy system⁷⁵ which could benefit from European-wide cooperation. Some topics will be supported by national funding and others by EU funding.

In addition, the scope of the ECRIA will have to be focused on a limited number of clear deliverables, where short-term progress and a clear European added-value can be demonstrated and achieved by pulling research efforts together.

Research activities included in an ECRIA should focus on TRLs 2 to 5.

⁷³ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

⁷⁴ https://setis.ec.europa.eu/system/files/Towards%20an%20Integrated%20Roadmap_0.pdf

⁷⁵ Examples of suitable topics could be: energy invertors, controllers and storage solutions to modulate supply from renewable sources; emergent forms of energy conversion (e.g. power to gas); interfaces between pro-active consumers and the grid; integration of different energy sources, delivery carriers, means of storage and usage modes; district storage. This is a non-exhaustive list.

a) *National funding.* Topics supported by national funding will bring together research activities at different stages of development:

- Recently-completed⁷⁶ research projects for which the dissemination of results can contribute to the objectives of the ECRIA.
- Ongoing research projects of participating eligible entities related to the topics included in the ECRIA.
- Commitment to future research activities related to the topics included in the ECRIA.

Activities supported either by institutional funding or resulting from competitive national calls can be included.

b) *EU funding.* The requested EU contribution shall be used to launch new research activities grouped under new topics. The EU contribution can also be used to fund the necessary coordination required to ensure that research activities are carried out in a transnational and multidisciplinary manner. Coordination costs should be kept to a minimum, and the EU contribution should be mainly used to fund research activities.

For new activities supported by the EU, eligible costs can be claimed in the same manner as for any other Research and Innovation Action under Horizon 2020.

The Commission considers that proposals requesting a contribution of up to EUR 2.5 million (which is expected to correspond to the equivalent national funding amount already committed would allow this specific challenge to be addressed appropriately.

To ensure their completeness, proposals must:

- Provide details of all the national funding contributed and committed to the ECRIA which leverages the EU contribution, in the form of details of the funds received by the respective participants for the recently-completed and ongoing projects included in the ECRIA, as well as for any other contributions in kind (e.g. human resources, use of existing research facilities). Details of the funding committed to future research activities related to ECRIA should be included.
- Include a clear common research and innovation agenda covering at least the next three years. The agenda shall include a clear and detailed description of the expected outputs and outcomes.
- Demonstrate how the programming schedule of the national resources incorporated to the ECRIA underpins the common agenda.

⁷⁶ Less than two years since the official project end date.

- Provide a description of the governance that will be put in place to implement the ECRIA. Governance should be kept as simple as possible and, where possible, it should make use of pre-existing governance structures.

The above elements will be taken into consideration in the evaluation of the quality and efficiency of the implementation criterion.

In addition, proposals should foresee:

- Activities to lay the foundations for long-lasting future co-operation by building a transnational critical mass in the funded research areas.
- Exchange of researchers to facilitate co-operation
- Shared use of existing research facilities, models and databases.

Expected Impact: First, ECRiAs will support the development of the common research and innovation agendas of the SET Integrated Roadmap, thus contributing to objectives of the Energy Union and the European Research Area.

This new ECRiA model will then develop a critical mass of research capacity in Europe, specifically addressing certain complex integration aspects of the energy system. This capacity, which does not exist yet, is crucial if Europe wants to complete successfully its energy transition in the long term. ECRiAs target the coordination of national efforts in order to develop synergies and improve the impact of public investment in emergent sectors.

Proposals should give priority to the following, which will be taken into consideration during evaluation under the impact criterion:

- Addressing the complexity of the integration of the energy system by targeting specific and limited aspects of the current problems where significant short-term progress can be achieved by integrating multidisciplinary research activities.
- Identifying gaps within national programmes/activities in order to decide the content of the new topics that will be supported by the EU contribution.
- Demonstrating the coherence of the different elements brought together and the added value of the choices made to deliver on the objectives in the most efficient and timely way possible.

Type of Action: Research and Innovation action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-34-2016: Joint Actions towards the demonstration and validation of innovative energy solutions⁷⁷

Specific Challenge: The EU needs to accelerate the transformation of its energy system by bridging the gap between research and the market with innovative solutions to obstacles in the development of low carbon technologies.

Bridging this gap often requires substantial volumes of investment which cannot be allocated by individual countries or by the European Commission on their own. European Union funding is only a limited part of the total funding available across Europe. In such cases, mobilising the necessary investment can only be achieved by pooling together financial resources from multiple countries, the Commission, and the private sector. This is a challenge because the funding landscape is complex.

One of the objectives of the SET Plan is to create funding synergies on such a big scale by organising joint programming actions between the entities responsible for public funding programmes and the Commission. ERA-NETs are the main instrument for joint programming actions within the SET Plan, and they also contribute to achieving the objectives of the European Research Area (ERA). In addition, they can play a key role in achieving the goal of the Energy Union of moving away from a fragmented system characterised by uncoordinated national policies and towards a new European R&I approach which accelerates the transformation of the energy system. It is therefore politically important to support ERA-NETs and to facilitate their existence as much as possible.

Scope: Proposals should aim at coordinating the research efforts of the participating Member States, Associated Countries and Regions in the areas and challenges targeted in the Renewable Energy Technologies, Decarbonising Fossil Fuels and Socio-Economics sections of the Competitive Low-Carbon Energy (LCE) call.

Individual topics suitable for ERA-NETs will be identified and discussed in close collaboration with Member States'/Associated Countries' representatives through the SET Plan governance bodies and with representatives of the Energy configuration of the H2020 Programme Committee.

Proposals will have to pay particular attention to tackling the following challenges:

- Focusing on demonstration projects and on bringing innovative low carbon energy solutions closer to commercial deployment.
- Encouraging industrial participation to leverage private sector investment.
- Strengthening the European industrial technology base, thereby creating economic growth and jobs in Europe.

⁷⁷ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

- Reducing the environmental impact of the energy system.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers are encouraged to implement other joint activities, including additional joint calls without EU co-funding.

Participation of legal entities from international partner countries is encouraged in the joint call as well as in additional joint activities, on the basis of common interest and mutual benefit. Participants from countries which are not automatically eligible for funding⁷⁸ may nonetheless request an EU contribution to cover the coordination costs of additional activities on the basis of the ERA-NET unit cost.

Expected Impact: It is expected that this action will help to:

- Establish long-lasting joint programming research efforts between Member States/Associated Countries in areas of common interest.
- Accelerate the time to market of affordable, cost-effective and resource-efficient technology solutions which decarbonise the energy system in a sustainable way.
- Encourage industrial participation and leverage private sector investment.
- Strengthen the European industrial technology base, thereby creating economic growth and jobs in Europe.
- Reduce the environmental impact of the energy system.
- Make a measurable contribution to the political objectives of the Energy Union, the SET Plan, and the European Research Area.

Type of Action: ERA-NET Cofund

The conditions related to this topic are provided at the end of this call and in the General Annexes.

LCE-35-2016: Framework Partnership Agreement supporting Joint Actions towards the demonstration and validation of innovative energy solutions⁷⁹

Specific Challenge: The EU needs to accelerate the transformation of its energy system by bridging the gap between research and the market with innovative solutions to obstacles in the development of low carbon technologies.

⁷⁸ http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/international-cooperation_en.htm

⁷⁹ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

Bridging this gap often requires substantial volumes of investment which cannot be allocated by individual countries or by the European Commission on their own. European Union funding is only a limited part of the total funding available across Europe. In such cases, mobilising the necessary investment can only be achieved by pooling together financial resources from multiple countries, the Commission, and the private sector. This is a challenge because the funding landscape is complex.

One of the objectives of the SET Plan is to create funding synergies on such a big scale by organising joint programming actions between the entities responsible for public funding programmes and the Commission. ERA-NETs are the main instrument for joint programming actions within the SET Plan, and they also contribute to achieving the objectives of the European Research Area (ERA). In addition, they can play a key role in achieving the goal of the Energy Union of moving away from a fragmented system characterised by uncoordinated national policies and towards a new European R&I approach which accelerates the transformation of the energy system. It is therefore politically important to support ERA-NETs and to facilitate their existence as much as possible.

Scope: The purpose of this call is to create a single⁸⁰ Framework Partnership Agreement to strengthen and simplify cooperation between the European Commission and Member States'/Associated Countries' programme managers and programme owners in the field of energy. This will allow Member States/Associated Countries to develop and implement a long-term action plan addressing this specific challenge with a set of ERA-NET Cofund actions. It is expected that the proposal submitted to this call will provide a broad coverage of countries and their different programme managers and owners in the energy sector.

The Commission will subsequently invite submission of proposals⁸¹ for Specific Grant Agreements under this Framework Partnership Agreement as grants to identified beneficiaries.

Expected Impact: The simplification of ERA-NET Cofund actions is an important milestone in stepping up long-term collaboration with and between Member States/Associated Countries. The following benefits are expected:

- Increased involvement of programme managers and programme owners in ERA-NET Cofund actions.
- Establishment of long-lasting joint programming research efforts between Member States/Associated Countries in areas of common interest.
- Increased involvement of the Commission in the preparatory phase of joint programming initiatives.

⁸⁰ This is in line with the objective of transnational coordination of national/regional programmes, with a maximum number of countries participating in the resulting joint actions.

⁸¹ The resulting ERA-NET Cofund actions are actions with specific characteristics that require a particular type of legal entity (programme managers and programme owners).

- Acceleration of the time to market of innovative, affordable, cost-effective and resource-efficient technology solutions which decarbonise the energy system in a sustainable way.
- Simplification of ERA-NET administrative arrangements: proposal submission, evaluation and grant preparation.
- Drastic reduction of the time between identifying research areas which could benefit from an ERA-NET and the launch of co-funded calls in those areas.
- Measurable contribution to the political objectives of the Energy Union, the SET Plan, and the European Research Area.

The Framework Partnership Agreement will cover the remaining duration of Horizon 2020. The proposal submitted to this call should include all legal entities that intend to participate in future energy ERA-NET co-funding actions during that period. Participants in the Framework Partnership Agreement for ERA-NET Cofund actions are not required to conclude a consortium agreement.

Type of Action: Framework Partnership Agreement

The conditions related to this topic are provided at the end of this call and in the General Annexes.

6. CROSS-CUTTING ISSUES

Proposals are invited against the following topic(s):

LCE-36-2016: Support to the energy stakeholders to contribute to the SET-Plan⁸²

Specific Challenge: Major investments in research and innovation are needed to develop and deploy the technologies needed for the transformation towards a decarbonised energy system. To address such a significant investment challenge, it is fundamental that public and private stakeholders involved in the relevant sectors join their forces, agree on common objectives and align strategies for achieve them.

Scope: The European Technology Platforms bring together stakeholders from academia, industry, and civil society involved in the development of research and innovation strategies for energy technologies, and interacting with relevant public authorities of the Member States as well as the European Commission.

⁸² This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

This topic calls for Coordination and Support Actions to assist the mission of certain of these European Technology Platforms in the field of energy in:

- contributing to the SET-Plan activities and strategy;
- helping define priorities, strategies, R&I investment decisions and programmes;
- collaborating between stakeholders in addressing energy system integration challenges;
- identifying technical and non-technical barriers to the delivery of innovation to the energy market;
- assisting the European Commission and Member States in defining the research programmes, financial instruments, and addressing the mentioned barriers;

in order to come to a coordinated, coherent, and efficient implementation of the objectives of the Energy Union including the 2030 Framework scenario and the 2050 Roadmap for a secure, affordable, competitive and efficient energy system.

Within the scope of this call, proposals are expected to address the coordination of stakeholders' activities as indicated above, as well as dissemination and networking towards stakeholder, and analysis and reporting for the purpose of monitoring and assessing progress towards research and innovation implementation plans of each sector

Proposals shall address one of the following specific energy technology sectors:

- Photovoltaics
- Ocean energy
- Zero emission fossil fuel power plants and energy intensive industry
- Biofuels

The Commission considers that proposals requesting a contribution from the EU of around EUR 0.6 million would allow this specific challenge to be addressed appropriately for a period of 2 years (*to be confirmed*).

Up to one proposal for each technology area indicated above could be funded.

Expected Impact: It is expected that an increased cohesion of the stakeholders involved in the sector will be reached through constructive and inclusive meetings, workshops, and conferences, and on the basis of the availability of scientifically sound, transparent and objective information for all interested parties. Moreover, stronger cooperation between stakeholders should enable agreement on concrete priorities, on longer term strategies, barriers to innovation and on better identification of the energy integration challenges. Increased communication between research, industry and civil society actors will facilitate exploitation of research results and hence the deployment of high-efficient and competitive

low-carbon energy technologies. This will contribute to the SET-Plan, providing it with adequate input from a wide spectrum of stakeholders, facilitating the development and implementation of its different activities on a sound basis.

Type of Action: Coordination and support action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

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Conditions for the Call - COMPETITIVE LOW-CARBON ENERGY

Opening date(s), deadline(s), indicative budget(s):⁸³

Topics (Type of Action)	Budgets (EUR million)		Deadlines
	2016	2017	
Opening: 27 Oct 2015			
LCE-07-2016-2017 (RIA)	61.30		16 Feb 2016
LCE-08-2016-2017 (RIA)	10.00		
LCE-23-2016 (RIA)	10.00		
LCE-24-2016 (RIA)	17.00		
LCE-25-2016 (RIA)	10.00		
LCE-31-2016-2017 (RIA)	10.00		
LCE-36-2016 (CSA)	2.40		16 Feb 2016
Opening: 08 Dec 2015			
LCE-01-2016-2017 (RIA)	20.00		05 Apr 2016
LCE-02-2016 (IA)	73.46		
LCE-03-2016 (CSA)	4.00		

⁸³ The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.

All deadlines are at 17.00.00 Brussels local time.

The Director-General responsible may delay the deadline(s) by up to two months.

The deadline(s) in 2017 are indicative and subject to a separate financing decision for 2017.

The budget amounts for the 2016 budget are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget 2016 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2017 budget are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017.

HORIZON 2020 - Work Programme 2016 - 2017
'Secure, Clean and Efficient Energy'

LCE-26-2016 (ERA-NET-Cofund)	10.00 ⁸⁴		05 Apr 2016
LCE-32-2016 (CSA)	1.70		
LCE-33-2016 (RIA)	10.00		
LCE-34-2016 (ERA-NET-Cofund)	30.80		
Opening: 14 Apr 2016			
LCE-35-2016 (FPA)			08 Sep 2016
Opening: 10 May 2016			
LCE-09-2016 (IA)	25.00		08 Sep 2016
LCE-13-2016 (IA)	10.00		
LCE-15-2016 (IA)	15.00		
LCE-19-2016-2017 (IA)	15.00		
LCE-20-2016-2017 (IA)	15.00		
LCE-22-2016 (RIA)	5.00		
Opening: 20 Sep 2016			
LCE-06-2017 (RIA)		20.00	05 Jan 2017
LCE-07-2016-2017 (RIA)		66.50	
LCE-08-2016-2017 (RIA)		10.00	
LCE-27-2017 (RIA)		15.00	
LCE-28-2017 (RIA)		15.00	

⁸⁴ of which EUR 6.00 million from 'Climate action, environment, resource efficiency and raw materials'.

HORIZON 2020 - Work Programme 2016 - 2017
'Secure, Clean and Efficient Energy'

LCE-29-2017 (RIA)			
LCE-30-2017 (RIA)			
LCE-31-2016-2017 (RIA)		10.00	
LCE-21-2017 (CSA)		15.00	05 Jan 2017
LCE-01-2016-2017 (RIA)		18.00	14 Feb 2017
LCE-04-2017 (IA)		65.12	
LCE-05-2017 (RIA)		28.00	
Opening: 09 May 2017			
LCE-10-2017 (IA)		10.00	07 Sep 2017
LCE-11-2017 (IA)		12.00	
LCE-12-2017 (IA)		8.00	
LCE-14-2017 (IA)		25.00	
LCE-16-2017 (IA)		7.00	
LCE-17-2017 (IA)		8.00	
LCE-18-2017 (IA)		10.00	
LCE-19-2016-2017 (IA)		15.00	
LCE-20-2016-2017 (IA)		10.00	
Overall indicative budget	355.66	367.62	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

Eligibility and admissibility conditions: The conditions are described in parts B and C of the General Annexes to the work programme with the following exceptions:

LCE-22-2016	<p>Proposals which do not include coordination with a Brazilian project will be considered ineligible. Therefore, the EU proposals must include a detailed explanation about the coordinated Brazilian proposal submitted in parallel to the Brazilian authorities.</p> <p>Participants in the EU Collaborative Project are required to conclude a coordination agreement with the Brazilian participants in the coordinated project funded by the Brazilian authorities.</p> <p>Proposals will be only selected on the condition that their corresponding coordinated Brazilian project is also selected for funding by the Brazilian authorities.</p>
LCE-23-2016	<p>Proposals which do not include coordination with a Mexican project will be considered ineligible. Therefore, the EU proposals must unambiguously identify the coordinated Mexican proposal to be submitted to the Mexican authorities, and include a detailed description of this proposal.</p> <p>Participants in the EU collaborative projects are required to conclude a coordination agreement with the Mexican participants in the coordinated project funded by the Mexican authorities.</p> <p>Proposals will only be selected on the condition that their corresponding coordinated Mexican project is also selected for funding by the Mexican authorities.</p>
LCE-20-2016-2017	<p>An off-take agreement with one or more airlines or alternative similar agreements must be signed before signature of the grant agreement to ensure additional budget for the project in order to produce substantial quantities of fuel and confirm the airline's commitment towards the development of aviation biojet.</p>

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in part H of the General Annexes to the work programme.

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant [guide](#) published on the Participant Portal.

Consortium agreement: Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.

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SME INSTRUMENT

Full details on the continuously open SME instrument call (H2020-SMEInst-2016-2017) are provided under the Horizon 2020 Work Programme Part – Innovation in SMEs (Part 7 of this Work Programme).

This Work Programme part contributes the following challenge of the SME instrument call:

SMEinst-2016-2017: Stimulating the innovation potential of SMEs for a low carbon and efficient energy system

Specific Challenge: SMEs play a crucial role in developing resource-efficient, cost-effective and affordable technology solutions to decarbonise and make more efficient the energy system in a sustainable way. They are expected to strongly contribute to one or a combination of more than one of the challenges outlined in the legal base of the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy'⁸⁵, in particular with regard to

- Reducing energy consumption and carbon footprint by smart and sustainable use (including energy-efficient products and services as well as 'Smart Cities and Communities'),
- Low-cost, low-carbon electricity supply (including renewable energy as well as CCS and re-use),
- Alternative fuels and mobile energy sources,
- A single, smart European electricity grid,
- New knowledge and technologies, and
- Robust decision making and public engagement.

⁸⁵ Council decision No 2013/743/EU establishing the Specific Programme implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020)

FAST-TRACK-TO-INNOVATION PILOT

Full details on this pilot are provided in the separate call for proposals under the Horizon 2020 Work Programme Part – Fast Track to Innovation Pilot (Part 18 of this Work Programme).

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Other actions⁸⁶

1. Horizon prize for CO₂ reuse⁸⁷

Preventing dangerous climate change is a key priority for the European Union. Europe is working hard to cut its greenhouse gas emissions substantially while encouraging other nations and regions to do likewise. One way to help these efforts is to make use of the CO₂ by integrating it in consumer products. CO₂ re-use technologies however are still facing a number of technical, commercial and/or financial barriers.

This inducement prize will therefore reward innovative products utilising CO₂ that could significantly reduce the atmospheric emissions of CO₂ when deployed at commercial scale.

The prize will induce actors in the field of CO₂ utilisation to do more to enhance their processes and products so that they reduce atmospheric emissions of CO₂. It aims also to mobilise and enhance private R&I investment, attract non-traditional players, create new partnerships and incentivise researchers and innovators to enhance efforts to abate emissions of anthropogenic CO₂ to atmosphere.

The specific rules of the contest will be published in 2016 by the European Commission, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Indicative prize amount: EUR 1.5 million.

Expected results: The prize winner will be the entrant that has developed a product demonstrating, over the duration of the contest, the most significant and measurable improvements in the mass of CO₂ utilised in it while overcoming technical, commercial and/or financial barriers. Efforts shall be replicable and scalable in order that the processes and products can be rolled out in the future. Clear commercialisation plans that are key to assuring medium-term benefits of the activities undertaken towards the prize will also have to be presented.

It is expected that the prize will accelerate innovation in CO₂ utilisation technologies, also in SMEs; facilitate discovering the real potential of CO₂ utilisation to contribute to climate mitigation; increase transparency about technology readiness, barriers, costs, environmental performance and innovation needs; increase leverage of private finance for innovation; provide with new business models and value chains in the CO₂ utilisation sector.

⁸⁶ The budget amounts for the 2016 budget are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget 2016 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2017 budget are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017.

⁸⁷ This activity directly aimed at supporting pilot activities is excluded from the delegation to INEA and will be implemented by the Commission services.

Eligibility criteria: The contest is open to all legal entities (including natural persons) or groups of legal entities regardless of its place of establishment.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply.

Essential award criteria: Only technologies that utilise CO₂ in consumer-oriented products, i.e. for final or industrial consumers, are eligible.

The prize will be awarded, after closure of the contest, to the contestant who in the opinion of the jury demonstrates a solution that best addresses following essential cumulative criteria⁸⁸:

- Net CO₂ emission reduction improvements based on prize-launch level (baseline) versus level of net CO₂ emissions at final submission;
- Overcoming barriers, including technical, commercial and financial, and going beyond business-as-usual in efforts to reduce net CO₂ emission;
- Commercialisation and scalability – demonstrating that actions taken are replicable in other settings, and that future actions will be taken in reducing both emissions and costs in order to further roll-out the benefits of the technology after the award of the prize;
- Environmental impacts.

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	3rd quarter 2016
Deadline for submission of application	2nd quarter 2019
Award of the prize	4th quarter 2019

Type of Action: Inducement prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Indicative budget:

⁸⁸ Further clarification of these criteria will be published in the Rules of Contest

2. Horizon prize for a Combined Heat and Power (CHP) Installation in a hospital using 100% Renewable Energy Sources⁸⁹

The integration and use of renewable energy in buildings for heat and power generation still encounter unsolved technological problems linked to the security and reliability of energy supply and related costs. Partly, it is due to unpredictable fluctuation of some renewable energy sources, such as solar or wind. The difficulty is even greater in cases where a 100% security of energy supply is essential such as for hospitals and especially when several renewable energy sources are used.

This inducement prize will reward a hospital that has an innovative and within its premises perfectly integrated combined heat and power (CHP) installation. This installation has to use at least three different European renewable energy technologies, include energy storage component(s) and be able to provide 100% of hospital's annual needs for energy consumption. In this context any renewable energy source is allowed.

The prize will induce innovative renewable energy solutions integrating several technologies into one energy system. Installing such kind of integrated equipment in the ecosystem of a hospital would not only ensure the security of its energy supply, but would also raise public awareness on renewable energy. Moreover, the prize aims to mobilise and enhance private and public investments for replication of similar solutions in Europe and worldwide.

The specific rules of contest will be published in 2016 by the European Commission which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Indicative prize amount: EUR 1 million.

Expected results: The prize winner will be the entrant (a hospital) that has installed and operated in its premises a new combined heat and power system integrating at least three different renewable energy technologies and with an innovative energy storage component. The proposed energy system solution shall be adaptable and replicable to other sites. Clear energy security and economic benefits shall be proven to assure these replications.

The prize will accelerate the introduction of renewable energy sources at larger scale. It will also encourage new venues for installing flexible and reliable CHP units from different renewable energy sources with zero carbon footprint. The contest gives as well a good opportunity to local small and medium-sized enterprises to demonstrate their expertise and know-how.

Eligibility criteria: The contest is open to all legal entities (including natural persons) or groups of legal entities regardless of its place of establishment.

⁸⁹ This activity directly aimed at supporting pilot activities is excluded from the delegation to INEA and will be implemented by the Commission services.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply.

Essential award criteria: A new combined heat and power system with minimum 2 000 000 kilowatt-hour electric per year (kWh/year) generated has to be installed and operated in its premises continuously for at least six months.

The prize will be awarded, after closure of the contest, to the entrant who in the opinion of the jury demonstrates a solution that best addresses the following essential cumulative criteria⁹⁰:

- Reliability, easy maintenance and safety of operation;
- Energy savings and CO2 emission reduction;
- Minimal/no-invasive impact on premises;
- Low operation and maintenance costs, with cost of the energy produced lower or equal to costs of standard installation;
- Active public participation;
- Sustainability of the distribution chain when biomass is used as a feedstock supply.

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	3rd quarter 2016
Deadline for submission of application	2nd quarter 2019
Award of the prize	4th quarter 2019

Type of Action: Inducement prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Indicative budget:

⁹⁰ Further clarification of these criteria will be published in the Rules of Contest.

3. Horizon prize for Integrated Photovoltaic System in European Protected Historic Urban districts ⁹¹

In Europe, architectural and planning rules for protected historic buildings lead to major technical constraints in integrating renewable energy such as photovoltaic. These problems call for innovative and creative solutions for building integrated photovoltaic that must combine aesthetic and photovoltaic technology applied in historical buildings that represent the artistic and cultural heritage of a city.

This inducement prize will reward a European protected historic urban district that has perfectly integrated in its buildings a photovoltaic system to generate and supply electricity for its own consumption. In this context the photovoltaic system includes all the necessary components to supply power within a district.

The prize will induce the integration of new photovoltaic systems in protected historic urban districts. It will also foster the development of the best suitable architectural and aesthetic design in combination with optimal technical solutions delivering the least visible impact and a minimal intrusion to the structure of the buildings. The prize aims as well to mobilise and enhance private and public investment for replication of similar solutions in Europe.

The specific rules of the contest will be published in 2016 by the European Commission, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Indicative prize amount: EUR 0.75 million.

Expected results: The prize winner will be the entrant (a community) that has installed and operated in the protected historic urban district in Europe a new building integrated photovoltaic system (BIPV) to provide electricity corresponding to at least 50% of the required electricity consumption of the district. The suggested energy solution shall be adaptable and replicable to other districts. Clear energy security and economic benefits shall be attained to assure replications.

It is expected that the prize will accelerate the innovation in photovoltaic technologies and architectural enhancement needed for sustainable use of European protected historic urban districts. Integrating photovoltaics in this type of districts will create new industrial expertise. It will also give a good opportunity to local small and medium-sized enterprises to develop new ideas and demonstrate their know-how.

Eligibility criteria: The contest is open to all legal entities (including natural persons) or groups of legal entities regardless of its place of establishment.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (regulation 966/2012) will apply.

⁹¹ This activity directly aimed at supporting pilot activities is excluded from the delegation to INEA and will be implemented by the Commission services.

Essential award criteria: A new BIPV in a protected historic urban district with a minimum power capacity of 50 kilowatt-peak (kWp) has to be installed and operated in its premises continuously for at least six months.

The prize will be awarded, after closure of the contest, to the entrant who in the opinion of the jury demonstrates a solution that best addresses the following essential cumulative criteria⁹²:

- High quality in terms of architectural and aesthetic design;
- Reliability, easy maintenance and safety of operation;
- Energy savings and CO2 emission reduction
- Minimal/no-invasive impact to the premises;
- Low operation and maintenance costs;
- Scalability and adaptation to different locations and different types of buildings;
- Active public participation to suggested solutions;

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	3rd quarter 2016
Deadline for submission of application	3rd quarter 2018
Award of the prize	2nd quarter 2019

Type of Action: Inducement prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Indicative budget:

⁹² Further clarification of these criteria will be published in the Rules of Contest.

4. Assessment of costs and benefits and of macro-economic impacts of energy efficiency policies⁹³

The action should address energy system modelling based on a consistent set of scenario assumptions to quantify the benefits and costs of European energy efficiency policies in EU28 for 2030 and beyond.

Type of Action: Public Procurement - 2 specific contracts under existing framework contract

Indicative timetable: 2016

Indicative budget: EUR 1.00 million from the 2016 budget and EUR 0.60 million from the 2017 budget

5. Assistance with the verification of compliance of national legislative measures implementing Directive 2012/27/EU on energy efficiency⁹⁴

In-depth legal analysis of the completeness and the conformity of national transposition and implementing measures with the provisions of the Directive for the 28 Member States following the notification of such measures to the Commission.

Type of Action: Public Procurement - 1 specific contract under existing framework contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 0.25 million from the 2016 budget

6. Improvement of CHP data collection⁹⁵

The Energy Efficiency Directive obliges Member States to report CHP data annually (Art.24 (6)). This helps policy makers on the European, national and regional level to define adequate policies regarding CHP.

An analysis of the existing CHP data collection process and improvement of the existing CHP data template will contribute to the improvement of the existing CHP data collection process in the near future.

Type of Action: Public Procurement - 1 direct service contract

⁹³ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

⁹⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

⁹⁵ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.50 million from the 2016 budget

7. Analysis of calculation method of Member States for their indicative national energy efficiency target (Article 3 of the Energy Efficiency Directive)⁹⁶

Analysis of the calculation method of each Member States' indicative national energy efficiency target for 2020 and input for the calculation method to be set for 2030.

Type of Action: Public Procurement - 2 specific contracts under existing framework contract

Indicative timetable: 1st quarter 2016 and 1st quarter 2017

Indicative budget: EUR 0.25 million from the 2016 budget and EUR 0.25 million from the 2017 budget

8. Online platform⁹⁷

Article 25 of the Energy Efficiency Directive obliges the Commission to establish an online platform in order to foster the practical implementation of this Directive at national, regional and local levels. That platform shall support the exchange of experiences on practices, benchmarking, networking activities, as well as innovative practices.

Establishment and maintenance of the platform over the period 2016 – 2017.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.50 million from the 2016 budget

9. Research on the need for training and retraining of energy system professionals⁹⁸

The on-going change of paradigm for energy systems is in particular problematic for craftsmen on all levels. Education based on existing technologies and educational framework may be obsolete fairly soon given that the new energy efficiency framework is still evolving. This creates the challenge on how the education system shall be adapted in the future for the relevant professions to incorporate the competences on energy efficiency, also to train and

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⁹⁸ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

“re-educate” the exiting personal (e.g. providers of energy services, energy auditors, energy managers and installers).

A Europe-wide study on the energy efficiency-related competences available and the opportunities to develop them to a new context in relation to world market needs and competitiveness.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.50 million from the 2016 budget

10. Monitoring the impact of the information and dissemination activities on available energy efficiency mechanisms and financial and legal framework carried out by the Member States⁹⁹

Assessment of the impact of information and dissemination activities on available energy efficiency mechanisms and financial and legal framework carried out by the Member States (required by Directive 2012/27/EU) targeting the relevant market actors such as consumers, builders, architects engineers, environmental and energy auditors and installers of buildings elements etc. An assessment is needed on the specific conditions established by each Member State for market actors so that they can provide the targeted information and advice to energy consumers on taking energy efficiency improvement measures.

This assessment will contribute to the identification of possible additional measures in this area and will also assess the necessary support for the development of relevant platforms (e.g. online platform) for exchanging information and best practices involving inter-alia the European social dialogue bodies in fostering training programmes for energy efficiency.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.30 million from the 2016 budget

11. Study on the impact of energy audits requirement on large industry¹⁰⁰

The study will assess the impacts of the requirement stemming from Art.8 on energy audits in large enterprises and SMEs. The study will look at the implementation in EU28 and will assess the impacts of the diffusion of energy audits in raising awareness about saving

⁹⁹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹⁰⁰ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

potentials in companies and in stimulating energy saving investments and in the diffusion of technological and organizational saving opportunities, and will analysis the follow-up measures undertaken by companies. The study will also examine the national and regional programmes targeting in specific SMEs and will assess their impacts.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.50 million from the 2016 budget

12. Support to the initiative on sustainable energy in the defence and security sector¹⁰¹

A specific consultation mechanism with Member States experts from the defence sector based on the model of the existing Concerted Actions and set up by the Commission Communication COM(2013) 542 final of 24 July 2013¹⁰² and confirmed in the Commission Report COM(2014) 387 final of 24 June 2014¹⁰³. This mechanism will focus on a) energy efficiency, particularly in building sector; b) renewable energy and alternative fuels; c) energy infrastructure, including the use of smart grid technologies and will:

- Examine the applicability of the existing EU energy concepts, legislation and support tools to the defence sector.
- Identify possible objectives and focus areas of action at EU level for a comprehensive energy concept for armed forces.
- Develop recommendations for a guidebook on renewable energies and energy efficiency in the defence sector with a focus on the implementation of the existing EU legislation, innovative technologies' deployment and the use of innovative financial instruments.
- Exchange information with the SET-Plan Steering Group on a regularly basis.

Exchanges, analyses and training to Member States on the implementation of EU policies and legislation on energy efficiency, renewable energy and energy infrastructure.

This action aims at facilitating exchanges of good practices with using renewables and promoting energy efficiency in the civilian types of energy use in the defence sector..

Type of Action: Public Procurement - 1 direct service contract

¹⁰¹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹⁰² "Towards a more competitive and efficient defence and security sector" <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0542&from=EN>

¹⁰³ "A New Deal for European Defence - Implementation Roadmap for Communication COM (2013) 542; Towards a more competitive and efficient defence and security sector" <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0387&from=EN>

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 0.75 million from the 2017 budget

13. Study analysing the cost-effective share of efficient district heating and cooling in the EU¹⁰⁴

The study is to look at the technical and economic potentials of using district heating and cooling, mapping relevant parameters, such as heat/cold demand density, renewable and waste heat supply sources, the cost of infrastructures and supply, the likely evolution of heat/cold supply prices of heat supplies, buildings' and industry's demand characteristics, such as temperature and equipment. The study would cover EU28.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 1.00 million from the 2016 budget

14. Study on utility models¹⁰⁵

Study on utility models in the household and services sectors for the supply of locally available energy efficient, renewable and waste/waste heat based heating and cooling, and the relationship with self-consumption (prosumer models) and energy efficiency measures.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.60 million from the 2016 budget

15. Study on heat market design including coordination, pricing and trading mechanisms, business models, as well as consumer protection, engagement and participation models and conditions¹⁰⁶

The study is to define the constituting components of functioning heat/cold markets, the regulatory, organisation and information framework and the role of the various actors in establishing effective platforms for market information, such as prices, the choices of products and services, and the mechanisms that are needed to bring together the consumers

¹⁰⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹⁰⁵ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹⁰⁶ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

with solutions providers. The impact of price regulation and competitive structures would be also examined. The study would analyse what are those instruments, such as information sharing platforms, price transparency instruments, technical advice, etc. that can help or needed to set up heat/cold markets.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.70 million from the 2016 budget

16. Continuation of the Building Stock Observatory and production of relevant bottom-up statistical data on buildings¹⁰⁷

The 2nd phase of the EU Building Stock Observatory will update and expand the snapshot produced in the 1st phase (February 2015- July 2016), and improve the monitoring of the energy performance of 28 MSs buildings stocks and provide measurable evidence on the progress towards the EU and national policy goals.

After the 1st phase of the Observatory it will be necessary to conduct bottom-up statistical study to infer on different relevant indicators for which there is not readily available data. In addition, it is necessary to tap into alternative data sources (e.g. cities, public buildings, EPC databases, utilities, industry initiatives, etc.) aggregate data, and produce useful information for the Observatory.

Type of Action: Public Procurement - 2 direct service contracts

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 2.00 million from the 2016 budget

17. Support for the implementation of the EU voluntary certification scheme for non-residential buildings and related follow-up to standardisation work on EPBD and related communication and dissemination¹⁰⁸

Article 11(9) of the EPBD requires the Commission to adopt, in consultation with the relevant sectors, a voluntary common European Union certification scheme (EVS) for the energy performance of non-residential buildings.

The EVS will be based on the new CEN standards for calculating the energy performance of buildings and will allow for the dissemination of the standard.

¹⁰⁷ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹⁰⁸ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

The design of the EVS including organisational format, labelling and relevant indicators, and the timely implementation will be ensured by these two contracts.

Type of Action: Public Procurement - 2 specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 1.00 million from the 2016 budget and EUR 1.20 million from the 2017 budget

18. Provision of technical assistance, studies and/or IT tools to collect and analyse relevant data and to properly assess complex technical, environmental, economic, legal and social aspects of different product groups¹⁰⁹

Provision of technical assistance, studies and/or IT tools to collect and analyse relevant data and to properly assess complex technical, environmental, economic, legal and social aspects of different product groups in order to inform policymakers with an objective and unbiased judgement of the likely impacts of different policy options and allow an efficient monitoring of existing legislation.

Type of Action: Public Procurement - direct service contracts and 20 specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 2.34 million from the 2016 budget and EUR 2.20 million from the 2017 budget

19. Technical support on standardisation work for energy related products including technical support to the Commission, and technical support to stakeholders on standardisation work for energy related products¹¹⁰

Two contracts giving the Commission services and environmental and consumer NGOs support for participating in Technical Committees and Working Groups on Standardisation.

Type of Action: Public Procurement - 5 specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.50 million from the 2017 budget

¹⁰⁹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹¹⁰ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

20. Support for the development and implementation of the EU Energy Star Programme including maintenance of the website, development of new technical specifications, impact analysis and market penetration survey ¹¹¹

Maintenance of the website assures the registration of industries (def. partners in the programme), product compliance check (on provided declarations, no 3rd party control) and public availability of data. Development of new specs provides technical support for negotiations with US-EPA on requirements tightening. Market penetration provides market analysis and advice on data quality.

Type of Action: Public Procurement - 3 direct service contracts

Indicative timetable: Website maintenance: January 2017 - June 2017; Technical specification: January 2017 - June 2017; Market penetration: January 2017 - December 2016

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.40 million from the 2017 budget

21. Communication efforts in support of the implementation of the legislative framework for energy efficiency ¹¹²

The Commission is often not in a position to engage and communicate directly with the stakeholders. Therefore, this action aims at developing communication activities towards the market uptake of innovation. Hence this action would be used to support a wide variety of activities including, but not limited to, events (e.g. conferences, webinars, etc.), publications (e.g. brochures, leaflets, etc.), press events (e.g. press briefings, visits - also in Member States, etc.), digital communications (e.g. videos, savings calculators, apps, etc.) and social media actions (e.g. twitter campaigns, viral messaging, etc.).

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017 (this action will be implemented through several specific contracts under existing framework contract, but due to the nature of the action (wide variety of activities) it is not possible to provide the number of contracts at this moment)

Type of Action: Public Procurement - specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.50 million from the 2017 budget

¹¹¹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹¹² This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

22. Studies on energy efficiency investments financing framework underpinning the work on the EPBD review under the "Smart finance for smart buildings initiative"¹¹³

Type of Action: Public Procurement - 2 direct service contracts

Indicative timetable: 2nd quarter 2016 and 2nd quarter 2017

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.50 million from the 2017 budget

23. EASME external communication activities (publications, audiovisual, events)

Organisation and logistic support for EU Sustainable Energy Week.

This action will also support the organisation of stakeholders meetings aiming at the exchange and replication of successful practices.

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017 (this action will be implemented through several direct service contracts and several specific contracts under existing framework contract, but due to the nature of the action (wide variety of activities) it is not possible to provide the number of contracts at this moment)

Type of Action: Public Procurement - direct service contracts and specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.50 million from the 2017 budget

24. Support initiative to assist actors working on sustainable energy at the local and regional level while taking into account existing initiatives and platforms

One service contract to support capacity building, knowledge exchange activities and modernise and update the online platform.

Type of Action: Public Procurement

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 0.70 million from the 2016 budget

¹¹³ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

25. Concerted Action EED: support to Member States and participating countries for the implementation of the Energy Efficiency Directive

The concerted action covers topics where coordination and/or harmonisation of approaches would be beneficial, but are not required by EU legislation.

A concerted action meets the conditions laid down in Article 190(1)(f)¹¹⁴ of the rules implementing the Financial Regulation and the relevant procedures will be applied. Concerted actions will be undertaken by organisations designated by the MS and other countries participating in the CA. It aims at fostering exchanges of information and experience between MS and participating countries.

Each concerted action will be allocated to a consortium of organisations designated and entrusted by the participating countries, under the coordination of one member of the consortium.

The main objectives of the CA EED II are as follows:

- To enhance and structure the sharing of information and experiences from national implementation whilst promoting good practice concepts in activities to improve and strengthen MS implementation of the Energy Efficiency Directive.
- To encourage dialogue between the Member States on common approaches for the effective implementation of particular parts of the Energy Efficiency Directive.
- To complement the work of the Committee assisting the European Commission.

Legal entities:

- 1 - Austrian Energy Agency (AEA), Mariahilferstraße 136, 1150 Vienna, Austria
- 2 - Flemish Energy Agency (VEA), Koning Albert II-laan 20, Brussels, BE-1000, Belgium
- 3 - Sustainable Energy Development Agency (SEDA) , 37, Ekzarh Josiff Str. 1000 Sofia, Bulgaria
- 4 - Ministry of Economy (MOE), Ulica grada Vukovara 78, 10 000 Zagreb, Croatia
- 5 - Ministry of Energy, Commerce, Industry and Tourism (MECIT), 13-15 Andrea Araouzou Str,1421 Nicosia, Cyprus
- 6 - Ministry of Industry and Trade (MIT), Na Františku 32, 110 15 Praha 1 Czech Republic
- 7 - Danish Energy Authority (DEA), Amaliegade 44, DK 1256, Copenhagen K, Denmark
- 8 - Ministry of Economic Affairs and Communications (MKM), Harju 11, 15072 Tallinn, Estonia
- 9 - Motiva Oy (Motiva), Urho Kekkosen katu 4-6 A, 100, Helsinki, Finland
- 10 - French Environment and Energy Management Agency (ADEME), 500 route des lucioles, 06560 Valbonne, France

¹¹⁴ Article 190(1)(f): Grants may be awarded without a call for proposals for actions with specific characteristics that require a particular type of body on account of its technical competence, its high degree of specialisation or its administrative power, on condition that the actions concerned do not fall within the scope of a call for proposals.

- 11 - Federal Ministry of Economic Affairs and Energy (BMWi), Frankfurter Str. 29-35, 65760 Eschborn, Germany
- 12 - Centre for Renewable Energy Sources and Saving (CRES), 19th km Marathonos Ave, 19009, Pikermi Attiki, Greece
- 13 - Hungarian Energy and Public Utility Regulatory Authority (HEA), 1054 Budapest, Bajcsy-Zsilinszky út 52, Hungary
- 14 - Department of Communications, Energy and Natural Resources (DCNER), 29-31 Adelaide Road, Dublin 2, Ireland
- 15 - Italian National Agency for new technologies, Energy and Sustainable Economic Development (ENEA), F19 SP002, Via Anguillarese 301, 0123 Rome, Italy
- 16 - Ministry of Economics (EM), Brīvības iela 55, Rīga, LV - 1519, Latvia
- 17 - Ministry of the Economy (Mineco), 19-21 Boulevard Royal, L-2449 Luxembourg, Luxembourg,
- 18 - State Enterprise Energy Agency (ENA), Gedimino pr. 38, LT-01104 Vilnius, Lithuania
- 19 - Ministry for Industry and Health (MEH), Auberge, De Castille, Valletta, VLT 1061, Malta
- 20 - Rijksdienst voor Ondernemend Nederland (RVO), Slachthuisstraat 71, 6041 CB, Roermond, The Netherlands
- 21 - Polish National Energy Conservation Agency (KAPE), 21/25 Nowowiejska St.00-665, Warsaw, Poland
- 22 - Ministry of Petroleum and Energy (OED), P.O. Box 8148 Dep, NO- 0033 Oslo, Norway
- 23 - Directorate General for Energy and Geology (DGEG), Av. 5 de Outubro, 208 (Edifício Sta. Maria), 1069 - 203 Lisboa, Portugal
- 24 - Romanian Energy Regulatory Authority (ANRE), Sos. Cotroceni nr.4, sector 6, Bucuresti, cod postal 060114, Romania
- 25 - Ministry of Economy of the Slovak Republic (MHSR), Mierova 19, 827 15 Bratislava, Slovakia
- 26 - Ministry of Infrastructure (MZIP), DE Kopitarjeva ulica 5, 2000 Maribor, Slovenia
- 27 - Institute for Diversification and Energy Saving (IDAE), Calle de la Madera, 8, E-28004 Madrid, Spain
- 28 - Swedish Energy Agency (STEM), Box 310, 631 04 Eskilstuna, Sweden
- 29 - Energy Saving Trust (EST), 21 Dartmoth Street, London, SW1H 9BP, UK

Type of Action: Grant to identified beneficiary - Coordination and support actions

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 4.00 million from the 2017 budget

26. Administrative arrangement with the JRC, to implement the relevant provisions of Energy Efficiency related Directives or Regulations, including Directive 2012/27/EU and the EPBD¹¹⁵

According to Council conclusions of 26.04.1994 (J.O. C 126 of 7.05.1994) on the role of the DG Joint Research Centre, the JRC activities include Institutional support activities such as Scientific and technical support activities necessary for the formulation and implementation of Community policies and of the tasks allotted to the Commission pursuant to the Treaties, which necessitate the neutrality of the JRC.

Type of Action: Provision of technical/scientific services by the Joint Research Centre

Indicative timetable: 2nd quarter 2017

Indicative budget: EUR 2.10 million from the 2017 budget

27. ELENA (European Local Energy Assistance)¹¹⁶

The ELENA (European Local Energy Assistance) facility was established in 2009 under the Intelligent Energy-Europe Programme II.

The ELENA facility, so far providing support to public entities, will be expanded to provide support to both public and private project promoters such as municipalities, regions, public/private infrastructure or transport operators (including public transport authorities and operators), energy service companies (ESCOs), retail chains, estate managers and SMEs/industry to develop and launch substantial, investible (bankable) investment projects and programmes which will contribute to achieving and going beyond the objectives of the EU energy policy. In the public sector, the ELENA Facility should continue helping cities (such as local authorities) to mobilise investments and implement their sustainable energy action plans.

The implementation of the ELENA facility will be subject to dedicated agreement between the selected International Financial Institution (IFI) and the European Commission. The IFI will ensure that Project Development Services are being awarded to eligible entities in accordance with the principles of transparency, proportionality, sound financial management, equal treatment and non-discrimination, lack of conflict of interests and compliance with internationally accepted standards. Eligible projects will be selected by the IFI and submitted to the European Commission for approval. The technical assistance grants will be provided to the Final Beneficiary in relation to feasibility and market studies, project structuring, business plans, justified energy audits, preparation of tendering procedures and contractual

¹¹⁵ These activities directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

¹¹⁶ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to the executive agency and will be implemented by the Commission services.

arrangements and include any other assistance necessary to develop Investment Programmes, excluding subsidies to investment (hardware) costs. Request for Project Development Services shall be addressed to the IFI according to the standard procedure for the submission of projects to the IFI. Applications are open to all participating countries following the CSA eligibility conditions and are not restricted by the availability of local financial institutions of the IFI in a specific country.

In 2016 and 2017, the ELENA Facility will aim at supporting significant investment projects or programmes in one or both of the following two pillars (1) and (2):

(1) Energy efficiency and distributed renewable energy. Projects could cover one or more of the following areas:

- public and private buildings, including social housing, commercial and logistic properties and sites, and street and traffic lighting, to support increased energy efficiency – e.g. refurbishment of buildings aimed at significantly decreasing energy consumption (both heat and electricity), such as thermal insulation, efficient air conditioning and ventilation, efficient lighting;
- integration of renewable energy sources (RES) into the built environment – e.g. solar photovoltaic (PV), solar thermal collectors and biomass;
- investments into renovating, extending or building new district heating/cooling networks, including networks based on combined heat and power (CHP); decentralised CHP systems (building or neighbourhood level);
- local infrastructure including smart grids, information and communication technology infrastructure for energy efficiency, energy-efficient urban equipment and link with transport.

(2) Urban transport and mobility in urban/suburban agglomerations and other densely populated areas¹¹⁷:

A part of the ELENA budget will be ring-fenced for the development of investment programmes (often with public sector involvement) in the field of urban transport that will contribute to the EU urban transport policy goals of halving the use of 'conventionally-fuelled' cars in cities by 2030, achieving essentially CO₂ free logistics in major urban centres by 2030 and attaining the 2020 objectives for urban areas presented in the Directive on the deployment of alternative fuels infrastructure.

Projects could cover one or more of the following areas:

- Investments to support the use and the integration of innovative solutions (beyond the current state of the art) for alternative fuels¹¹⁸ in urban mobility, e.g. in vehicles and in

¹¹⁷ The use of the ELENA Facility in the field of transport is a pilot. Possible continuation and adjustments in 2017 will take into account lessons learnt in 2016.

¹¹⁸ See the Communication on 'Clean Power for Transport: A European alternative fuels strategy' (COM/2013/017)

refuelling infrastructure for alternative fuel vehicles and other actions to support the wide-scale use of 'alternative fuels' in urban areas.

- Investments to introduce at a wide scale new, more energy-efficient transport and mobility measures in any modes in urban areas.

The preparation of a Sustainable Mobility Plan (SUMP) could be one of deliverables of an ELENA funded project, and/or the ELENA-planned investments could contribute to the implementation of an existing or updated SUMP.

Following areas shall be excluded:

- long-distance transport infrastructure

Type of Action: Delegation Agreement

Indicative budget: EUR 20.00 million from the 2016 budget and EUR 30.00 million from the 2017 budget¹¹⁹

28. InnovFin Energy Demonstration Projects (EDP) Pilot Facility¹²⁰

Meeting the EU's energy goals for 2020 and beyond will require continuous development and commercialisation of new generations of low-carbon energy technologies and systems. First-of-a-kind, commercial-scale demonstration projects are essential to show the technical and commercial viability of new generations of energy technologies. These actions are predominant in the Strategic Energy Technology (SET) Plan Integrated Roadmap¹²¹, especially regarding wind energy, solar energy, bioenergy and CCS (carbon capture and storage). A key barrier to implementing first-of-a-kind demonstration projects is the lack of finance for high risk/high-return projects due to their pre-commercial development stage and the unproven nature of the technologies concerned at industrial scale.

InnovFin Energy Demonstration Projects (EDP) aims to make loans of between EUR 7.5 million and EUR 25 million¹²² to first-of-a-kind commercial-scale industrial demonstration projects in the field of energy at TRL 7/8, i.e. demonstration in operational environment and systems complete and validated, or to extend guarantees to financial intermediaries who will make such loans. Projects must relate to unproven pre-commercial technologies in the field of innovative renewable energy, fuel cells and hydrogen technologies. Loans provided under the EDP Pilot to fuel cells and hydrogen projects cannot exceed 1/3 of the available budget. Projects might include, amongst others, first-of-a-kind power, heat, and/or fuel production plants and first-of-a-kind manufacturing plants. Projects must have a commercial component and demonstrate the ability to generate revenues after completion.

¹¹⁹ of which EUR 15.00 million from 'SC4-WP 2016-2017'.

¹²⁰ This activity directly aimed at supporting pilot activities is excluded from the delegation to INEA and will be implemented by the Commission services.

¹²¹ <https://setis.ec.europa.eu/set-plan-process/integrated-roadmap-and-action-plan>

¹²² Transactions above EUR 25 million may be possible.

The budget of this action complements the allocation of EUR 100 million in 2015 to this pilot facility from revenues and repayments generated by the FP7 RSFF.

Expected impact: **InnovFin Energy Demonstration Projects (EDP)** will help in:

- de-risking investments by demonstrating and validating, at industrial scale, technology performance, installation time and costs, operation and maintenance costs, and reliability and lifetimes;
- reducing perceived investment risks for investors;
- preparing for further roll-out to the market of the technologies by industry, with a view to achieve the EU's energy targets for 2020 and beyond;
- fostering industrial development and hence creating jobs and growth in the EU.
- contributing to the Energy Union objectives, by ensuring higher security of supply, enabling increasing share of indigenous low carbon energy sources in the European energy mix and supporting leading edge technologies to become a world leader in renewable energy.

Type of Action: Financial Instrument

Indicative timetable: 1st quarter 2016

Selection procedure: EIB checks the financial viability of each potential financing operation while DG Research & Innovation, assisted by other Commission DGs, approves each operation against the eligibility criteria[[See p.2 of http://www.eib.org/attachments/documents/innovfin_energy_demo_projects_flysheet_en.pdf] set for the InnovFin EDP Facility.

Indicative budget: EUR 50.00 million from the 2016 budget and EUR 0.00 million from the 2017 budget (p.m.)

29. Coordination of renewable fuel stakeholder's strategy in the field of aviation¹²³

The political and regulatory landscape for biofuels is under transition. The revision of the Renewable Energy Directive and the Fuel Quality Directive wants to accelerate the transition from the first generation biofuels and other renewables options in transport as well as account for the effects of Indirect Land Use Change (ILUC).

The 2030 framework for Climate and Energy sets a binding target of 27% of renewable energy in our energy mix by 2030 and a 40% greenhouse gas emissions reduction target to which to the aviation community wants to contribute.

¹²³ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

While surface transport modes may have several options to contribute to decarbonisation, on a short to medium term, aviation has currently no alternative to kerosene than renewable drop-in fuels. In addition aviation has several other specificities to take into account such as its international nature and the absence of taxation on kerosene.

An update and renewed approach to the 2011 Biofuel Flight Path is therefore needed and support is needed to set-up an organisational framework involving key stakeholders in the field covering production, distribution and use of renewable fuels, and tackling the different aspects (research and innovation, sustainability, industrial production, legal framework (including in Member States) and financing mechanisms. The action will also foresee resources to perform studies on these aspects.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 1.20 million from the 2016 budget

30. Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)¹²⁴

The aim of this action is to create a single forum representing the European 2nd and 3rd generation alternative and renewable liquid and gaseous fuels (lignocellulosic, algae, microbial, power to gas, solar fuels, fuels from industrial waste gases, fuels from plastic and refinery waste) producers. The objective is to facilitate addressing common issues on policy and market penetration barriers for these alternative and renewable fuels. The key problem faced by the sector is that existing policy addresses mainly biofuels excluding alternative and some types of renewable fuels while all of these fuels face similar development, financing and market penetration issues.

Additionally, the forum will allow early-movers to exchange information and experience from industrial capacity, experience and understanding of the use of alternative and renewable fuels, maximizing their impact on policy strategy by addressing all modes of transport; road, maritime and aviation.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 2.00 million from the 2017 budget

¹²⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to the executive agency and will be implemented by the Commission services.

31. A joint mapping platform for bioenergy issues¹²⁵

The action aims to join in a common platform three ongoing activities that are used to disseminate information on biofuels and bioenergy. These are the BIOMAP, the BioJet Map and the BioResources Map. The BIOMAP is an extensive database and map for information on EC funded projects, industry projects and commercial plants, EU and national policies, standards, technology description and schematics, key players and stakeholders etc on biofuels. The BioJet Map is an extensive database on bio-kerosene use in either test of commercial flights on a global scale and it has been developed in close cooperation with the aviation industry as well as Airbus and Boeing. Finally the BioResources Map is a tool to track the sustainable production of biomass on a global scale. The three tools are powerful instruments for information as well as research purposes and are at various stages of development. It would benefit the research community and the industry as well as the public sector if all three could be developed on one structure.

At the same time it is envisaged to expand the BIOMAP to cover also the heat, power, CHP and polygeneration sectors of bioenergy and further to all other energy sectors of Horizon 2020 (PV, wind, ocean, more efficient coal combustion, etc.). This can be developed in a powerful dissemination and information tool for all completed and ongoing projects of FP7 as well as all new contracts to be signed under H2020 facilitating dissemination and diffusion of information to the energy research community. This will subsequently result to a more effective search for partners with dedicated expertise and better preparation of proposals.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 1.00 million from the 2016 budget

32. Carbon Capture and Sequestration (CCS) knowledge sharing and European CCS Demonstration Project Network¹²⁶

Knowledge sharing is key for the successful demonstration and dissemination of CCS technologies. Main forum in Europe is the European CCS Demonstration Project Network which started with the projects co-funded under the European Energy Projects for Recovery (EEPR) but, with fewer projects, it should expand towards other European projects as well as create stronger links between projects on global level. There is a need for EU funding for the Secretariat of the Network as well as for increased international knowledge sharing activities.

¹²⁵ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

¹²⁶ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

The Secretariat will also support the implementation of the CCS European industrial initiative roadmap launched in the framework of the SET-Plan.

Indicative duration: 24 months

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 1.00 million from the 2017 budget

33. Monitoring and assessment of the performance indicators of renewable energy, investment and RES market trends in Europe¹²⁷

As part of 2020 strategy, the EU has committed to ensure that at least 20% of the final energy consumption is sourced from renewable energy by 2020, and by 2030 the RES share shall be at least 27%. The ambition of Europe remaining a global leader in renewable energy deployment, while contributing to the growth, competitiveness of the EU industry and employment strongly transpires from the priorities of the European Commission work programme.

Delivering on these objectives, requires regular monitoring and performance assessment of various RES sectors, through improved data collection and monitoring of performance indicators on the overall growth of European renewable energy sector, investments in the RES industry, market trends within EU renewables markets across the value chains of each renewable energy sector, economic growth and employment, and the market shares on the EU market of domestic and imported RES products and components.

Such monitoring should also assess impacts on the energy security, including avoided fossil fuel imports and their cost, and GHG emission savings.

This assessment should result in annual data and statistics on all of above mentioned renewable energy indicators in support of Commission's evaluation and assessment of Member State and the EU progress towards 2020 and 2030 renewable energy targets.

Indicative duration: 48 months

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 2.00 million from the 2016 budget

¹²⁷ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

34. 2018 Renewable energy progress report¹²⁸

The Renewable Energy Directive requires the Commission, on biennial basis and drawing on the Member State national renewable energy reports, to present a comprehensive assessment of EU and Member State progress towards 2020 renewable energy targets. These reports shall include analysis of data and description of renewable energy policy measures in Member States, based on national renewable energy reports, and the data and impacts of the EU renewable energy policy and biofuel consumption in the EU and in main third countries of supply.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 3rd quarter 2016

Indicative budget: EUR 0.80 million from the 2016 budget

35. Technical support for evaluation of Member State strategic energy plans for post 2020 for the deployment of renewable energy, and their adequacy for achieving the binding EU renewable target for 2030¹²⁹

In line with the new Policy framework for climate and energy in the period from 2020 to 2030, Member States will be required to prepare their National plans for competitive, secure and sustainable energy. These plans will simplify and streamline the current separate processes for reporting on renewable energy, energy efficiency and greenhouse gas reduction for the period after 2020. The first Member State plans will be prepared in 2017. This action is aimed at supporting the Commission in technical assessment and evaluation of the national renewable energy targets expressed by Member States, and their contribution to the overall EU renewable energy target for 2030 on the basis of Member States national pledges included in the new National plans for competitive, secure and sustainable energy.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 4th quarter 2017

Indicative budget: EUR 0.40 million from the 2017 budget

¹²⁸ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹²⁹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

36. Technical support for a comprehensive assessment of practical implementation of administrative procedures for RES projects in Member States and recommendations for common guidelines for permit procedures and coordination requirements ¹³⁰

The Renewable Energy Directive requires Member States to take measures at national and local levels to facilitate the administrative and licensing procedures for renewable energy producers, to ensure that these procedures are streamlined between all actors involved at national and regional levels and that simplified rules are applied for small RES producers. Despite these legal requirements, Commission's regular assessments have repeatedly found persistent difficulties and weak progress in this area in Member States. In view of these findings and the commitment undertaken in 2015 Renewable Energy progress report, the Commission intends to launch a comprehensive study on the practical implementation of administrative procedures for renewable energy projects in Member States and assess the need for establishing comprehensive guidelines for simplification of permission and administrative procedures for RES producers. This study contract is intended to support the Commission in this work.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 0.35 million from the 2016 budget

37. Leading the debate on the EU ambition to become world leader in renewable energy with a post-2020 vision

To become world leader in renewable energy requires an inclusive approach across the EU putting together European and national levels. This action aims at enhancing exchange and cooperation between policy makers, politicians and citizen groups at national and European level regarding renewable policy developments, in order to facilitate the development of sound policies for the 2030 framework to ensure that the at least 27 % renewable target is met cost-effectively.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 1.50 million from the 2016 budget

¹³⁰ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

38. Support activities for further development and implementation of the sustainability scheme for biofuels¹³¹

Art.18 of the Renewable Energy Directive foresees the procedures and ways in which the verification of compliance with the EU biofuels sustainability criteria can be demonstrated. Voluntary schemes are increasingly the most common way of demonstrating this compliance. The Commission is regularly assessing and deciding on approval of new national or international schemes, in order to assess whether these schemes meet adequate standards of reliability, transparency and independent auditing. In view of the assessment of extending such sustainability criteria to all bioenergy uses after 2030, the following technical support work will involve carrying out the necessary technical assessment of new voluntary schemes, and include assessment of possible future options for adapting the technical assessment work of such schemes to cover for all bioenergy uses.

Type of Action: Public Procurement - 2 direct service contracts

Indicative timetable: 2nd quarter 2016 and 2nd quarter 2017

Indicative budget: EUR 0.20 million from the 2016 budget and EUR 0.20 million from the 2017 budget

39. Technical support activities to assess the competitiveness of the European renewable energy industry¹³²

In view of the European Commission's work priorities for 2015-2020, including making Europe the world leader in renewable energy, this study is aimed at supporting the Commission's policy work with a technical assessment of the competitiveness aspects related to EU RES sectors and associated sub-sectors, namely biomass energy, hydropower, geothermal energy, ocean energy, solar energy and wind energy. It will assess and define the future potential for renewable energy products and services for different companies, sizes in the EU and provide an in-depth strategic outlook about future development needs and the necessary policy framework to that end, and identify ways and means for increasing the competitiveness of the European renewable energy sector.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 2nd quarter 2016

Indicative budget: EUR 0.30 million from the 2016 budget

¹³¹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹³² This activities directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

40. Information and communication activities¹³³

Renewable Energy Directive sets the EU legislative framework for meeting the 2020 renewable energy target. 2 technical assistance contracts will be concluded in 2016 and 2017, to support the Commission information and communication activities and stakeholder engagement in the area of EU renewable energy policy in view taking stock on progress towards the 2020 targets, and consultation process on the preparation of the new 2030 framework on renewable energy. Such work may include: organisation of conferences, technical preparation of information products on RES policies, and other.

Type of Action: Public Procurement - 1 direct service contract in both 2016 and 2017

Indicative timetable: 1st quarter 2016 and 1st quarter 2017

Indicative budget: EUR 0.40 million from the 2016 budget and EUR 0.40 million from the 2017 budget

41. Energy System Modelling¹³⁴

The Energy Union Communication calls for an integrated EU energy system. For this purpose, Commission Services needs the support of EU wide energy modelling system which can be used to investigate different scenarios that are relevant to this goal and to related EU policies in the field (e.g. Set-Plan, Connecting Europe Facility, etc.). As a first indication, the main aspects to be investigated are the impact of the increasing share of variable renewable energy sources, the potential of increased interconnections between Member States and between energy networks and the potential of energy storage. The model should allow to assess effects at EU level but also at regional levels and have the capacity to simulate variations at the level of a day, and seasons.

Indicative duration: 36 months

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 2.00 million from the 2017 budget

¹³³ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹³⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

42. Studies on the EU energy system in support of policy¹³⁵

The EU energy system is in permanent transition and policy needs to be supported by studies answering evolving priorities. This action will gather a set of experts / stakeholders which have the capacity to carry out studies on a variety of topics within short / medium term deadlines. Provision for flexibility will be made to engage ad-hoc experts (not exceeding 20% of the contract).

As a first estimate, 50% or more of the effort will bear on EU electricity system with diverse aspects such as smart meters, demand-response, smart grids, storage, interconnections, market design, etc., not only in terms of technologies but also in terms of regulations and business models. The context is the increasing share of variable renewable energy sources in the production of electricity. The rest of the effort will cover other networks such as gas (e.g. security of supply) and heat (e.g. district heating, heating and cooling) as well as synergies between these networks.

Indicative duration: 36 months

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 2.50 million from the 2016 budget

43. Support to Research and Innovation Policy in the areas of Renewable Energy, Carbon Capture and Storage and More Efficient Coal Combustion¹³⁶

Technical assistance and economic and policy analysis to support various aspects of the Research and Innovation policy in one or more areas of the energy field. The areas concerned are i) renewable electricity (e.g. wind power, photovoltaics, concentrated solar power, bioenergy, enhanced geothermal systems, ocean energy, hydro power), ii) heating and cooling through renewable energy and fossil fuels, iii) biofuels, iv) Carbon Capture and Storage, including utilisation of Carbon Dioxide and v) More Efficient Coal Combustion.

These analyses may include:

- Technology foresight and potential;
- Analysis of the above specified EU energy areas vis-à-vis global competitors as well as vis-à-vis other technologies at the various levels of the supply lines: an overview and

¹³⁵ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹³⁶ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

analysis of trends in the different renewable energy sectors and possible synergies with Carbon Capture and Storage. Key factors to maintain global technological leadership.

- Research and innovation strategies of major international players, including inventory, impacts and best practices of the support put in place in leading countries;
- Impact of various European and national, regional, local policies (energy, industrial and SME policy, fiscal, environmental, employment, R&D etc.) Economic analysis e.g. business cases, supply line economics, value-added analysis;
- Market take-up issues;
- Environmental and health related impacts of projects in the above specified areas and possible areas for risk mitigation to be undertaken by research and innovation;
- Public perception and awareness;
- Analysis of capacities and skills.

Type of Action: Public Procurement - 8 specific contracts

Indicative timetable: as of 1st quarter 2016

Indicative budget: EUR 6.00 million from the 2016 budget

44. Support services for exploitation of research results

A framework contract for Support Services for Exploitation of Research Results will be concluded in 2015. This framework contract will provide to the Commission external assistance for an on-demand service for the benefit of former and current grant beneficiaries of the Energy Theme of the FP7 Cooperation Specific Programme and of Energy Challenge of Horizon 2020 (in the areas of 'Renewable energy technologies', 'Enabling the decarbonisation of the use of fossil fuels during the transition to a low-carbon economy', 'Social, economic and human aspects of the energy system' and as regards activities targeting specifically 'New knowledge and technologies' and actions in the field of energy supported by "Fuel Cells and Hydrogen Joint Undertaking") in view of supporting them with the exploitation of their EU-funded research results.

This would involve, inter alia, identification of market potential and opportunities, evaluation of competing technologies, development of business plans, assessment of the costs for upscaling, and protection of IPR.

Specific contracts will be concluded in 2016 and in 2017 based on the individual needs of the grants to be assisted.

Type of Action: Public Procurement - up to 70 specific contracts in both 2016 and 2017

Indicative timetable: 1st quarter 2016 until 4rd quarter 2017

Indicative budget: EUR 0.80 million from the 2016 budget and EUR 0.80 million from the 2017 budget

45. Study on a comprehensive EU approach as regards international cooperation in the energy area – the R&I perspective¹³⁷

Setting up an international cooperation policy in R&I in energy becomes necessary because of several reasons: the political importance of the Energy Union, the increasing weight of the European Union on international scene, the European Union to become the number one in renewable energy in the world, the size of EU competitors and the size of potential markets in third countries.

Complementarily, the EU Development Programmes plan spending nearly EUR 3.5 billion (2014-2020) with developing countries for promoting access to energy, penetration of renewable and other developing measures. Half of this coverage is Sub-Saharan Africa, the rest being split between South East Asia, Central Asia, Caribbean and Pacific.

The objective of the study will be to develop a strategy for cooperation with industrialised countries and emerging economies from one hand and with developing countries and regions from the other hand. The study will explore the potential for increased international role of the EU (energy diplomacy). It will also explore the conditions to be realised for facilitating the penetration of EU industry and R&I players into third markets.

It will have to open the door to concrete projects taking also benefit from possible synergies with Partnership Instrument or EU Development Programmes.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 0.70 million from the 2016 budget

46. Grant to named beneficiary to support the operations of the European Energy Research Alliance (EERA)¹³⁸

The European Energy Research Alliance of the SET Plan (EERA) was established in 2008 to accelerate the development of new energy technologies by creating and implementing Joint Research Programmes in support of the Strategic Energy Technology (SET) Plan.

This grant is intended to support the operations of the EERA, in particular the work of its Secretariat and the coordination of its SET Plan Research Networks.

¹³⁷ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹³⁸ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners and earth observation networks is excluded from the delegation to INEA and will be implemented by the Commission services.

The goal is to consolidate EERA as a key and effective stakeholder in the implementation of the SET Plan, the research and innovation pillar of the Energy Union.

To this end, this grant shall support the following activities:

- Ensure that SET Plan Research Networks address critical advanced research areas (TRLs 1/2 to 4/5) of European interest to accelerate the development of the energy transition through the alignment of national resources.
- Ensure that the roadmaps of the SET Plan Research Networks are aligned with the priorities of the SET Integrated Roadmap.
- Ensure the participation of EERA representatives in the decision fora of the SET Plan whenever requested.
- Facilitate the flow of information related to the progress and outcomes of EERA's SET Plan Research Networks and Integrated Research Programmes, and ensure that their evaluation reports and details of the appointed evaluators are systematically communicated to the SET Plan Steering Group via the Commission.
- Raise awareness amongst new potential members and industrial partners of the EERA, its work and its goals.
- Facilitate the work of the SET Plan Research Networks' coordinators.
- Encourage the participation of universities in EERA
- Facilitate access to knowledge and research results by industrial partners to ensure efficient technology transfer.
- Agree on indicators with the Commission to be measured annually in order to provide evidence of the contribution of EERA to the development of an European Research Area in the field of energy.

The duration of the grant shall be 24 months.

Legal entities:

European Energy Research Alliance (EERA AISBL), Rue de Namur 72, 1000 Brussels, Belgium

Type of Action: Grant to identified beneficiary - Coordination and support actions

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timetable: 2016

Indicative budget: EUR 0.60 million from the 2016 budget

47. Contribution to Implementing Agreements (IA) of the International Energy Agency (IEA)¹³⁹

The Commission represents the European Union in the Implementing Agreements concluded under the framework of the International Energy Agency where it participates in activities in certain areas of energy research. The annual financial contributions will be paid to the entities responsible for managing the following agreements:

- Geothermal
- Bioenergy
- Ocean Energy
- ISGAN (International Smart Grid Action Network)
- GHG derived from fossil fuels use
- Solar Power and Chemical Energy Systems
- Photovoltaic Power
- Energy Technology System Analysis
- Test Solar Heating and Cooling
- More Efficient Coal Combustion Centre
- Wind
- Renewable Energy Technology Deployment

Type of Action: Subscription

Indicative timetable: as of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.40 million from the 2016 budget and EUR 0.40 million from the 2017 budget

¹³⁹ This activity directly aimed at supporting the promotion of coherent and effective cooperation with third countries is excluded from the delegation to INEA and will be implemented by the Commission services.

48. Contribution to the International Renewable Energy Agency (IRENA)¹⁴⁰

The European Union is a member of IRENA. In the Council Decision on the Conclusion of the IRENA Statute by the EU, it is concluded that the Community becomes a full member of IRENA. According to the organisation's Statute and Financial Regulation this implies the obligation to pay an annual contribution to its budget covering the participation of the EU in IRENA's activities. IRENA's main objective is to disseminate best practices in the field of renewables as the principal platform for international cooperation in the field, a centre of excellence on renewable energy and a repository of policy, technology, resource and financial knowledge. This includes:

- The promotion of the widespread and increased adoption and the sustainable use of all forms of renewable energy globally, including in the EU, in particular to bring down costs and also to increase market experience, in order to contribute to economic growth and social cohesion as well as access to and security of energy supply,
- Support activities for countries in their transition to a renewable energy future,
- Reducing of barriers for renewable energy, stimulating best practice and raising awareness.

Type of Action: Subscription

Indicative timetable: as of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.48 million from the 2016 budget and EUR 0.48 million from the 2017 budget

49. Contribution to the Global CCS Institute¹⁴¹

The EC has been a 'Collaborative Participant' in the Global CCS Institute (GCCSI) so far, a status that has allowed it to express its political support to the Global CCS Institute without any legal obligations attached. Following the changes that the GCCSI is introducing to its business model, GCCSI is gradually moving to a membership system (between 2015 and 2018) based on fees. As of 2015 the EC will be an Associate Member to the Institute, which is very similar to the position it has been enjoying so far. The EC shall in 2015 continue to support the Global CCS Institute's promotion of the development of CCS as a key climate change mitigation tool and its corresponding objectives (such as promoting large-scale demonstration to technology development, encouraging knowledge sharing and increasing public and stakeholders' awareness).

¹⁴⁰ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

¹⁴¹ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services.

Type of Action: Subscription

Indicative timetable: as of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.002 million from the 2016 budget and EUR 0.002 million from the 2017 budget

50. Support to the European Innovation Partnership on Smart Cities and Communities and its Market Place ¹⁴²

This action shall ensure constant and high quality support to the Market Place of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) and the Solar Decathlon Europe (SDE) initiative:

- Maintenance and further development of the interactive web site of the above mentioned Market Place,
- Providing Programme Management Office (PMO) services to handle daily logistics, communications, social network contributions, etc.,
- Providing support for the SDE secretariat. While the competition themselves would be funded by other sources, the secretariat will ensure continuity of the SDE initiative and synergies with the Market Place,
- Individual high quality support to each Action Clusters in terms of content as well as logistics,
- Policy analysis and modeling of the Smart Cities context system to allow for sound decision making with regard to novel solutions, new market designs, business models, players and policy instruments, (this shall provide assessments of the costs and other impacts of Smart City related policies, policy instruments, including the social, environmental and economic impacts of policy decisions),
- Regular reports containing meaningful up-to-date figures and information to be used for marketing the EIP-SCC further.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 4th quarter 2016

Indicative budget: EUR 3.00 million from the 2016 budget

¹⁴² This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

51. Smart Cities and Communities information system ¹⁴³

The action will provide technical monitoring database and analysis of the Smart Cities and Communities lighthouse projects, following a predecessor phase.

First, a technical monitoring database will be fed with economic, technical, environmental and social performance data of the technologies and technology mixes used in the projects.

Then, the action will analyse and disseminate the data, provide semantic inquiry facilities and replication modelling tools, thereby permitting decision-makers at various levels of governance to benefit from a one-stop-shop of well-documented best-practice cases, generating also sound evidence and recommendations for the Commission's future policies and R&I activities in the field.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 2.50 million from the 2017 budget

52. Support Services for the Covenant of Mayors ¹⁴⁴

The "*Covenant of Mayors*", launched in 2008, is a bottom-up movement of 6200 signatory towns and cities that through formal municipal council decisions commit to exceeding the 2020 objectives of EU energy and climate policy in terms of reducing CO₂ emissions through *i.a.* enhanced energy efficiency and cleaner energy production and use. To achieve this, "*Covenant of Mayors*" signatories (cities, municipalities, provinces or regions) commit to develop and implement Sustainable Energy Action Plans (SEAP) within a year following the signature and to inform the Commission on progress of their implementation, through the monitoring reports, to be submitted every 2 years. The SEAPS are scrutinised by the Commission (JRC) and signatories failing to produce SEAPs are suspended.

The number of signatories continues to grow and to date more than 4500 SEAPs have been submitted and the first implementation reports have arrived. The growth is expected to continue both in accession and in monitoring activities as a 2030 perspective will be published for the "*Covenant of Mayors*" in 2015, which will also combine both the mitigation and adaptation pillars (*i.e.* the "*Covenant of Mayors*" and the Mayors Adapt initiatives). This success will require an increased support in order to guarantee continuation of the programme through a new updated contract extending the Covenant of Mayors support services and structures as from end 2016 when the current contract expires.

¹⁴³ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹⁴⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

The services to be covered by a new tender are:

- ensuring of operation and increase of technical and administrative capacity of the Covenant of Mayors Office;
- negotiations, liaison and co-ordination of Covenant supporting structures and territorial coordination entities;
- operation of help desk and direct assistance to participating cities and communities;
- extension, development and management of the Internet portal and other communication tools, and ensuring continuous presence in media;
- capacity building and networking with relevant stakeholders;
- providing the necessary services to help the "*Covenant of Mayors*" develop into a more self-governed exercise, inter alia through facilitation of peer reviews and dedicated assessment/verification tasks.
- preparing and supporting the transition of the "*Covenant of Mayors*" beyond 2020, stimulating signatories to extend their commitments.
- coordinating with the adaptation pillar (i.e. the "*Mayors Adapt*" initiative managed by DG CLIMA) as well as providing technical support and capacity building on integrated approaches between mitigation and adaptation.
- stimulate synergies and interactions with relevant urban and other local energy actions and initiatives, including in islands and remote regions; creation of a "one-stop-shop" for the promotion and facilitation of innovative energy concepts in local communities.

These support services would be complemented by the "*Mayors Adapt*" initiative (or its successor) by DG CLIMA.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 4th quarter 2016

Indicative budget: EUR 4.00 million from the 2016 budget

53. Administrative arrangement with the JRC on the identification of the technologies and innovative solutions that support to the cost-effective implementation of EU energy policy priorities within the ESIF

According to Council conclusions of 26.04.1994 (J.O. C 126 of 7.05.1994) on the role of the DG Joint Research Centre, the JRC activities include Institutional support activities such as Scientific and technical support activities necessary for the formulation and implementation of Community policies and of the tasks allotted to the Commission pursuant to the Treaties, which necessitate the neutrality of the JRC.

In this case the support will be for the work will be done in the context of the energy related Cohesion Policy priorities, with the objective of improving the structuring and implementation of projects financed through the European Structural and Investment Funds. The work would aim at:

- alignment of activities at local and regional level through the identification of the technologies and innovative solutions that support in the most cost-effective way the EU energy policy priorities.
- targeted delivery of information, knowledge and expertise for policy-makers, authorities and stakeholders in charge of energy and research and innovation policies, especially within the framework of the Research and Innovation Strategies for Smart Specialisation (RIS3) and the S3 Platform
- organising thematic seminars and guidance materials that will aim to strengthen regional/local capacities, but also to ensure cooperation amongst the interested Member States and regions
- focus broadly on research and innovation aspects – both on the supply of and demand for innovative solutions
- supporting the broader Cohesion Policy priorities on energy within thematic objectives related to Low-Carbon Energy (TO4) and Smart Energy Infrastructure (TO7.4)

Type of Action: Provision of technical/scientific services by the Joint Research Centre

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 0.40 million from the 2016 budget

54. Support to the Slovak Presidency Conference on the European Strategic Technology Plan (Set-Plan) 2016¹⁴⁵

Slovakia will be organising the 9th Strategic Energy Technology Plan conference. The conference will take place in Slovakia during the Slovak Presidency of the Council of the European Union.

Rate of co-financing: The maximum possible rate of co-financing is 75% of the total eligible costs¹⁴⁶.

Legal entities:

any entity designated by the Presidency under its responsibility

¹⁴⁵ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to the executive agencies and will be implemented by the Commission services.

¹⁴⁶ SET Plan Conferences are high level Policy events co-funded by the Presidency and the Commission to reflect the mutual interest in these initiatives.

Type of Action: Grant to identified beneficiary - Coordination and support actions

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timetable: 4th quarter 2016

Indicative budget: EUR 0.25 million from the 2016 budget

55. Support to the UK Presidency Conference on the European Strategic Technology Plan (Set-Plan) 2017¹⁴⁷

UK will be organising the 10th Strategic Energy Technology Plan conference. The conference will take place in XX during the UK Presidency of the Council of the European Union.

Rate of co-financing: The maximum possible rate of co-financing is 75% of the total eligible costs¹⁴⁸.

Legal entities:

any entity designated by the Presidency under its responsibility

Type of Action: Grant to identified beneficiary - Coordination and support actions

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Indicative timetable: 4th quarter 2017

Indicative budget: EUR 0.25 million from the 2017 budget

56. An Economic Evaluation for SET-Plan¹⁴⁹

The EU has committed to the 20-20-20 (20% less GHG, 20% RES, 20% more energy efficiency) strategy by 2020, and for 2030 the corresponding targets are 40-27-27. Energy Union gives us the ambition of Europe remaining a global leader in renewable energy development, while empowering the consumer and contributing to the growth, competitiveness of the EU industry and employment. New priorities in energy security need to play a leading role. This requires an integrated approach to the future energy system.

¹⁴⁷ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹⁴⁸ SET Plan Conferences are high level Policy events co-funded by the Presidency and the Commission to reflect the mutual interest in these initiatives.

¹⁴⁹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

Delivering on these objectives, requires a consolidated and targeted upgrade of SET-Plan, taking into account the feasibility of technological progress and linked to Member States' own priorities.

A comprehensive economic analysis of the expected outcome of this new integrated policy, leading us to a new restructured energy system needs to be undertaken. This study contract is to undertake this economic analysis.

Scenarios of alternative transition paths to a new energy system should be used as a basis, and the overall influence from and impact upon the European economy should be taken fully into consideration.

Proposals should be specific about the methodology to be used for the analysis. This should be appropriate to the comprehensive nature of the study.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 1.00 million from the 2017 budget

57. Mapping technology priorities of SET-Plan to incentives for the investment community¹⁵⁰

The EU has committed to the 20-20-20 (20% less GHG, 20% RES, 20% more energy efficiency) strategy by 2020, and for 2030 the corresponding targets are 40-27-27. Energy Union gives us the ambition of Europe remaining a global leader in renewable energy development, while empowering the consumer and contributing to the growth, competitiveness of the EU industry and employment. New priorities in energy security need to play a leading role. This requires an integrated approach to the future energy system.

The investment levels that will be necessary to achieve the 2030 objectives are estimated as an additional 200b€ per year, above those investments needed to maintain quality of service and to adjust for increases in demand.

Public funds from the EU and Member States cannot accomplish this investment level – they can perhaps reach 10% of these levels. New financial instruments, such as InnovFin in Horizon 2020, are being put into place to enable a certain level of leverage. But these too may not be enough.

Incentives for technology investment are embedded in many existing energy policy programmes, the experiences and successes vary in type and scale.

¹⁵⁰ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

This contract will make an inventory of available incentives, in whichever form, whether hard (mandatory legislation) or soft (voluntary measures with rewards), or conditional subsidies, taking into account constraints (e.g. state aid), for energy technology investments. This must include all EU member states, and several representative examples of other countries' incentive packages from the international community.

A comparative assessment will be undertaken of these incentives and recommendations formulated for the EU.

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2017

Indicative budget: EUR 0.60 million from the 2017 budget

58. Community-Building of the investment community for innovative energy technology projects¹⁵¹

The EU has committed to the 20-20-20 (20% less GHG, 20% RES, 20% more energy efficiency) strategy by 2020, and for 2030 the corresponding targets are 40-27-27. Energy Union gives us the ambition of Europe remaining a global leader in renewable energy development, while empowering the consumer and contributing to the growth, competitiveness of the EU industry and employment. New priorities in energy security need to play a leading role. This requires an integrated approach to the future energy system.

The investment levels that will be necessary to achieve the 2030 objectives are estimated as an additional 200b€ per year, above those investments needed to maintain quality of service and to adjust for increases in demand.

Public funds from the EU and Member States cannot accomplish this investment level – they can perhaps reach 10% of these levels. New financial instruments, such as InnovFin in Horizon 2020, are being put into place to enable a certain level of leverage. But these too may not be enough.

Awareness and community-building of private investors potentially interested in the new challenges of the energy sector in Europe is therefore necessary and urgent.

This contract will be given to organisations with a proven track-record in community-building. Ideally, a single contract will cover all Europe. If several able teams become evident, the Commission might consider a small group of contracts centered on specific financial and/or technology centres in Europe. Reaching out to investors from outside Europe will be an advantage.

¹⁵¹ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

Type of Action: Public Procurement - 1 -2 direct service contracts in 2016 and 1-3 direct service contracts in 2017

Indicative timetable: 1st quarter 2016 and 1st quarter 2017

Indicative budget: EUR 0.75 million from the 2016 budget and EUR 0.75 million from the 2017 budget

59. Communication and information activities¹⁵²

Communication activities such as meetings, conferences and publications should support dissemination of knowledge and information to relevant stakeholders.

Type of Action: Public Procurement - 2 direct service contracts in both 2016 and 2017

Indicative timetable: as of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.40 million from the 2016 budget and EUR 0.40 million from the 2017 budget

60. External expertise¹⁵³

This action will support the use of appointed independent experts for the monitoring of running projects where appropriate as well as for the evaluation of entries submitted to prize contests.

Type of Action: Expert Contracts

Indicative timetable: As of 1st quarter 2016 and 1st quarter 2017

Indicative budget: EUR 0.91 million from the 2016 budget and EUR 0.90 million from the 2017 budget

61. Experts for policy relevant analyses and forward looking reflection¹⁵⁴

Independent experts will namely be appointed to provide analyses of past activities in policy relevant areas and to advise on or support the design and implementation of EU Research Policy and the SET-Plan, such as:

- Mid-term evaluation of the Horizon 2020 Energy Challenge;

¹⁵² This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

¹⁵³ *Monitoring of FP7 projects, for which EUR 0.65 million is allocated, is excluded from the delegation to the executive agencies and will be implemented by the Commission services.*

¹⁵⁴ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

- Final evaluation of FCH JU;
- Mid-term evaluation of FCH 2 JU.

A special allowance of EUR 450/day will be paid to the experts appointed in their personal capacity who act independently and in the public interest.

Type of Action: Expert Contracts

Indicative timetable: as of 1st quarter 2016 and as of 1st quarter 2017

Indicative budget: EUR 0.30 million from the 2016 budget and EUR 0.20 million from the 2017 budget

62. Specific Grant Agreements (SGAs) for ERA-NET Cofund actions supporting Joint Actions towards the demonstration and validation of innovative energy solutions¹⁵⁵

Once the Framework Partnership Agreement (FPA) resulting from the call for topic LCE-35 is concluded between the Commission and the consortium of programme owners and programme managers, each individual ERA-NET Cofund action will be implemented as a Specific Grant Agreement (SGA) linked to the FPA.

Individual topics suitable for SGAs will be identified and discussed in close collaboration with Member States'/Associated Countries' representatives through the SET Plan governance bodies and with representatives of the Energy configuration of the H2020 Programme Committee. The actual submission of the simplified ERA-NET Cofund proposals will only be possible after the Commission services have agreed with the scope and budget of each ERA-NET to be co-funded.

Proposals will have to pay particular attention to tackling the following challenges:

- Focusing on demonstration projects and on bringing innovative low carbon energy solutions closer to commercial deployment.
- Encouraging industrial participation to leverage private sector investment.
- Strengthening the European industrial technology base, thereby creating economic growth and jobs in Europe.
- Reducing the environmental impact of the energy system.

¹⁵⁵ This activity directly aimed at supporting public-public partnerships with Member States and Associated Countries, technology platforms with industrial partners is excluded from the delegation to INEA and will be implemented by the Commission services

This topic is connected to topic LCE-35 'Framework Partnership Agreement supporting Joint Actions towards the demonstration and validation of innovative energy solutions'

This action will only support ERA-NET Cofund actions in areas covered by the Renewable Energy Technologies, Decarbonising Fossil Fuels and Socio-Economics sections of the Competitive Low-Carbon Energy (LCE) call.

Proposals should pool the necessary financial resources from the participating national (or regional) research programmes, with a view to implementing a joint call for proposals resulting in grants to third parties with EU co-funding in this area. Proposers are encouraged to implement other joint activities, including additional joint calls without EU co-funding.

Participation of legal entities from international partner countries is encouraged in the joint call, as well as in additional joint activities, on the basis of common interest and mutual benefit. Participants from countries which are not automatically eligible for funding¹⁵⁶ may nonetheless request an EU contribution to cover the coordination costs of additional activities on the basis of the ERA-NET unit cost.

Proposals will be evaluated by internal experts, ensuring in particular the compliance with the technical and legal requirements for ERA-NET Cofund actions, compliance with the agreed scope and budget, and overall research excellence.

The time from proposal submission to signature of the grant agreement should not normally exceed 4-5 months, and should thus contribute to a faster launch of joint calls and faster implementation of actions. Proposals shall not be submitted later than October 31st of the budgetary year.

The following activity is an example of SGA which could be supported in 2017, subject to positive developments in on-going European industrial CCS demonstration:

- *Commercial-Scale Demonstration of CCS:*
 - o *Scope:* The project should support the operation of a CO₂ capture plant demonstrating the application of post-combustion CCS technology to a commercial-scale coal-fired power plant with the subsequent transport and permanent offshore geological storage of the CO₂. The project should intend to demonstrate the full CCS system in the real-life operational environment, i.e. bring the technology at a TRL of 7 and possibly even beyond.

Type of Action: Specific Grant Agreement

This action is connected to the 'Framework Partnership Agreement supporting Joint Actions towards the demonstration and validation of innovative energy solutions' (topic LCE-35-2016).

¹⁵⁶

http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/international-cooperation_en.htm

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

Legal entities: Signatories of the Framework Partnership Agreement (LCE-35-2016).

Proposals may include additional legal entities, provided that they fulfil the eligibility criteria for ERA-NET Cofund actions and under the condition that they accede to the Framework Partnership Agreement at the time of the signature of the Specific Grant Agreement.

Indicative timetable: as from 1st quarter 2017

Indicative budget: EUR 31.00 million from the 2017 budget

63. Support to European Standardisation Organisations on standardisation work for energy related products. specific grant agreement under FW grant agreement with CEN CENELEC ¹⁵⁷

Funding rates in compliance with the conditions set out in the framework partnership agreement with CEN-CENELEC, in particular according to the scale of unit costs for eligible staff costs established therein and up to 100% for other eligible direct costs.

Identified beneficiaries:

CEN – European Committee for Standardisation, Avenue Marnix 17, 1000 Brussels Belgium

CENELEC – European Committee for Electrotechnical Standardisation, Avenue Marnix 17, 1000 Brussels Belgium

Type of Action: Framework Partnership Agreement with identified beneficiary

Specific Grant Agreement awarded to identified beneficiary for Coordination and Support Action under the Framework Partnership Agreement FPA/CEN/ENTR/2009/C(2008)8758.

Framework Partnership Agreement with identified beneficiary and specific grants awarded to identified beneficiary for Coordination and Support Action under the Framework Partnership Agreement.

According to Regulation (EU) No 1025/2012, CEN and CENELEC are the competent European standardisation organisations to carry out this work and are therefore the identified beneficiaries.

The standard evaluation criteria, thresholds, weighting for award criteria and the maximum rate of co-financing for this type of action are provided in parts D and H of the General Annexes.

¹⁵⁷ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to EASME and will be implemented by the Commission services.

Indicative timetable: 2nd quarter 2016 and 2nd quarter 2017

Indicative budget: EUR 0.50 million from the 2016 budget and EUR 0.50 million from the 2017 budget

64. Standardisation request to the CEN (European Committee for Standardisation) for algae and algae-based products in support of the implementation of the RED Directive 2009/28/EC¹⁵⁸

Standards for new types of algae-based biofuels and algae-based products are needed to facilitate the introduction of these new products into the market.

Standards facilitate the market deployment of new biofuels, bio-liquids and bio-products and thus the implementation of the RED, the FQD and the Bioeconomy strategy by the Member States.

Identified beneficiary:

CEN – European Committee for Standardisation, Avenue Marnix 17, 1000 Brussels Belgium

Type of Action: Framework Partnership Agreement with identified beneficiary

Specific Grant Agreement awarded to identified beneficiary for Coordination and Support Action under the Framework Partnership Agreement FPA/CEN/ENTR/2009/C(2008)8758.

Framework Partnership Agreement with identified beneficiary and specific grants awarded to identified beneficiary for Coordination and Support Action under the Framework Partnership Agreement.

According to Regulation (EU) No 1025/2012, CEN is the competent European standardisation organisation to carry out this work and is therefore the identified beneficiary.

Indicative timetable: 1st quarter 2016

Indicative budget: EUR 1.00 million from the 2016 budget

¹⁵⁸ This activity directly aimed at supporting the development and implementation of evidence base for R&I policies and supporting various groups of stakeholders is excluded from the delegation to INEA and will be implemented by the Commission services.

Budget¹⁵⁹

	Budget line(s)	2016 Budget (EUR million)	2017 Budget (EUR million)
Calls			
H2020-EE-2016-2017		93.00	101.00
	<i>from 32.040301</i>	<i>93.00</i>	<i>101.00</i>
H2020-LCE-2016-2017		349.66 ¹⁶⁰	367.62
	<i>from 08.020303</i>	<i>252.20</i>	<i>256.50</i>
	<i>from 32.040301</i>	<i>97.46</i>	<i>111.12</i>
Contribution from this part to call H2020-BG-2016-2017 under Part 9 of the work programme		2.00	
	<i>from 08.020303</i>	<i>2.00</i>	
Contribution from this part to call H2020-FTIPilot-2016 under Part 18 of the work programme		13.70	
	<i>from 08.020303</i>	<i>6.85</i>	
	<i>from 32.040301</i>	<i>6.85</i>	
Contribution from this part to call H2020-SCC-2016/2017 under Part 17 of the work programme		60.00	71.50
	<i>from 32.040301</i>	<i>60.00</i>	<i>71.50</i>

¹⁵⁹ The budget figures given in this table are rounded to two decimal places.

The budget amounts for the 2016 budget are subject to the availability of the appropriations provided for in the draft budget for 2016 after the adoption of the budget 2016 by the budgetary authority or, if the budget is not adopted, as provided for in the system of provisional twelfths.

The budget amounts for the 2017 budget are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2017.

¹⁶⁰ To which EUR 3.00 million from part 12 (budget line 02.040301) and EUR 3.00 million from part 12 (budget line 08.020305) will be added making a total of EUR 355.66 million for this call

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Contribution from this part to call H2020-SMEInst-2016-2017 under Part 7 of the work programme		46.00	50.00
	<i>from 08.020303</i>	23.00	25.00
	<i>from 32.040301</i>	23.00	25.00
Other actions			
Expert Contracts		1.21	1.10
	<i>from 08.020303</i>	0.50	0.20
	<i>from 32.040301</i>	0.71	0.90
Grant to Identified beneficiary		0.85	4.25
	<i>from 08.020303</i>	0.60	0.25
	<i>from 32.040301</i>	0.25	4.00
Financial Instrument		50.00	
	<i>from 08.020303</i>	50.00	
Delegation Agreement		15.00 ¹⁶¹	20.00 ¹⁶²
	<i>from 32.040301</i>	15.00	20.00
Provision of technical/scientific services by the Joint Research Centre		0.40	2.10
	<i>from 32.040301</i>	0.40	2.10
Public Procurement		40.54	19.45
	<i>from 08.020303</i>	7.70	1.00

¹⁶¹ To which EUR 5.00 million from part SC4-WP 2016-2017 (budget line 06.030301) will be added making a total of EUR 20.00 million for this action

¹⁶² To which EUR 10.00 million from part SC4-WP 2016-2017 (budget line 06.030301) will be added making a total of EUR 30.00 million for this action

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	<i>from 32.040301</i>	32.84	18.45
Specific Grant Agreement		1.50	31.50
	<i>from 08.020303</i>		31.00
	<i>from 32.040301</i>	1.50	0.50
Subscription		0.88	0.88
	<i>from 08.020303</i>	0.20	0.20
	<i>from 32.040301</i>	0.68	0.68
Estimated total budget		674.74	669.40

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